

**California High-Speed Rail Authority**



**RFP No.: HSR 14-32**

**Request for Proposals for Design-Build  
Services for Construction Package 4**

**Book III, Part B.1  
Directive Drawings**



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CIVIL DIRECTIVE NOTES

A. GENERAL SITE NOTES

- 1. FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO THE COMMENCEMENT OF WORK AND REPORT ANY DISCREPANCIES TO THE AUTHORITY’S REPRESENTATIVE.
- 2. ALL CONSTRUCTION ACTIVITIES AFFECTING THIRD PARTY FACILITIES SHALL BE COORDINATED WITH THE PROPER JURISDICTION AUTHORITY.
- 3. FOR ABBREVIATIONS, SEE GENERAL DIRECTIVE DRAWINGS.
- 4. FOR SYMBOLS, SEE GENERAL DIRECTIVE DRAWINGS.
- 5. "ORIGINAL GROUND" SHOWN ON CROSS SECTIONS REFERS TO THE APPROXIMATE EXISTING GROUND LINE AT THE DESIGNATED CENTERLINE, BASELINE, LAYOUT LINE OR SECTION LINE.
- 6. ALL WORK SHALL CONFORM TO ALL LOCAL, STATE AND FEDERAL CODES AND ORDINANCES IN EFFECT.
- 7. PROVIDE AND MAINTAIN PROPER BARRICADES, RAILINGS, GUARDS, FLAGGING, LIGHTING, OR OTHER DEVICES NECESSARY FOR THE PROTECTION OF LIFE AND PROPERTY.
- 8. VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING MATERIALS.

B. GRADING

- 1. DO NOT PERFORM ANY GRADING OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW ONTO ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATION OCCUR THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY MAKE ALL REMEDIAL ACTIONS NECESSARY.
- 2. KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM DUST NUISANCE.
- 3. PROVISIONS SHALL BE MADE TO PREVENT SURFACE WATERS FROM DAMAGING THE CUT FACE OF AN EXCAVATION OR THE SLOPED SURFACES OF A FILL. FURTHERMORE, PROVISIONS SHALL BE MADE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE SITE.
- 4. THE LIMITS OF THE AREA TO BE GRADED SHALL BE FLAGGED BEFORE THE COMMENCEMENT OF THE GRADING WORK.
- 5. ALL GRADING OPERATIONS SHALL BE PERFORMED IN CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE WATER POLLUTION CONTROL AND WATER QUALITY STANDARDS CONTAINED IN THE LATEST CALTRANS STORM WATER QUALITY HANDBOOKS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	S. MILITELLO
DRAWN BY	R. MINCIO
CHECKED BY	H. NGUYEN
IN CHARGE	J. CHIRCO
DATE	01/24/2014



CALIFORNIA HIGH-SPEED TRAIN PROJECT  
GENERAL DIRECTIVE

GENERAL DIRECTIVE NOTES  
CIVIL

CONTRACT NO.
DRAWING NO. DD-GE-001
SCALE NO SCALE
SHEET NO.

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TRACK DIRECTIVE NOTES

- 1. THE GENERAL BASIS FOR TRACK STANDARDS AND MATERIALS SHALL BE THE AREMA MANUAL.
- 2. TRACK AND TRACK COMPONENTS SHALL BE DESIGNED AND FABRICATED TO PERFORM UNDER THE PREVAILING AND EXTREME CLIMATIC AND ENVIRONMENTAL CONDITIONS OCCURRING WITHIN THE GEOGRAPHIC EXTENT OF THE SYSTEM.
- 3. THE PROFILE GRADE LINE IS CARRIED ON THE TOP OF LOW RAIL THROUGH HORIZONTAL CURVES AND SPIRALS FOR THE DESIGNATED TRACK.
- 4. THE LENGTHS OF TRACK IS BASED ON CENTER OF TRACK ALIGNMENT.
- 5. UNLESS SEPARATE TRACK PROFILES ARE GIVEN, TRACK PARALLEL TO THE DESIGNATED TRACK ARE AT THE SAME TOP OF RAIL ELEVATIONS PROJECTED ON EITHER PERPENDICULAR OR RADIAL LINES FROM THE DESIGNATED TRACK CENTERLINES.
- 6. BALLASTED TRACKS ARE GENERALLY PREFERRED FOR YARD TRACKS. DESIGNERS SHALL FOLLOW THE REQUIREMENTS ASSOCIATED WITH CONSTRUCTION OF BALLASTED TRACK IN THE CALIFORNIA HIGH SPEED TRAIN DESIGN MANUAL.

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CALIFORNIA HIGH-SPEED TRAIN PROJECT  
GENERAL DIRECTIVE

GENERAL DIRECTIVE NOTES  
TRACK

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STRUCTURAL DIRECTIVE NOTES:

A. SPECIFICATIONS FOR DESIGN AND CONSTRUCTION

- 1. CONSTRUCTION SPECIFICATION SHALL BE THE DESIGN-BUILD STANDARD SPECIFICATION, CALIFORNIA HIGH SPEED TRAIN.
- 2. THE STRUCTURAL DESIGN OF STRUCTURES SUPPORTING HIGH SPEED TRAINS SHALL BE BASED ON THE REQUIREMENTS OF THE CALIFORNIA HIGH SPEED RAIL AUTHORITY.
- 3. DESIGN CRITERIA FOR HIGHWAY BRIDGES SHALL BE THE CALIFORNIA BRIDGE DESIGN SPECIFICATION. FOR HIGHWAY BRIDGES PASSING OVER THE HIGH SPEED TRAIN THE BRIDGE DESIGN SPECIFICATION SHALL BE SUPPLEMENTED BY THE CALIFORNIA HIGH SPEED TRAIN REQUIREMENTS FOR SEISMIC DESIGN.
- 4. DESIGN CRITERIA FOR RAILROAD STRUCTURES NOT SUPPORTING HIGH SPEED TRAINS SHALL BE THE AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING (APRIL 2008). FOR RAILROAD BRIDGES PASSING OVER THE HIGH SPEED TRAIN THE BRIDGE DESIGN SPECIFICATION SHALL BE SUPPLEMENTED BY THE CALIFORNIA HIGH SPEED TRAIN REQUIREMENTS FOR SEISMIC DESIGN.

B. DESIGN METHOD

- 1. DESIGN SHALL BE PERFORMED TO THE LOAD AND RESISTANCE FACTOR (LRFD) DESIGN METHOD.
- 2. THE DESIGN OF PRESTRESSING AND PARTIAL PRESTRESSING SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 5.9 OF AASHTO LRFD WITH CALIFORNIA AMENDMENTS WITH THE FOLLOWING EXCEPTION: NET TENSION STRESSES ARE NOT ALLOWED IN THE PRECOMPRESSED TENSILE ZONE AFTER ALL LOSSES HAVE OCCURRED.

C. GENERAL

- 1. SEE GENERAL DIRECTIVE DRAWINGS FOR ACRONYMS AND ABBREVIATIONS.
- 2. ALL STRUCTURAL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE SPECIFICATIONS AND ALL OTHER DRAWINGS RELATED TO THE WORK.
- 3. EMBEDDED ITEMS SUCH AS PIPES, INSERTS, SLEEVES AND CONDUITS, AND ANY RECESSES, NICHES OR OPENINGS REQUIRED FOR UTILITY, ARCHITECTURAL, MECHANICAL AND ELECTRICAL INSTALLATIONS ARE NOT SHOWN ON THE STRUCTURAL DRAWINGS. CONTRACTOR SHALL REFER TO THE UTILITY, ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR THE LOCATIONS AND DETAILS OF THESE ITEMS. CONTRACTOR SHALL REVIEW AND APPROVE ALL PENETRATIONS PRIOR TO CONSTRUCTION. PENETRATIONS WHICH LOCAL THICKENING OF CONCRETE OR STEEL MEMBERS AND /OR SUPPLEMENTAL REINFORCING SHALL BE SHOWN ON THE STRUCTURAL DRAWINGS.
- 4. THE VERTICAL CONTROL OF ALL TRACK STRUCTURES IS BASED ON THE TOP OF LOW RAIL ELEVATION IN SUPERELEVATED STRUCTURES.

- 5. CONTRACTORS ATTENTION IS DIRECTED TO THE AREAS OF SAG VERTICAL CURVES. IN SUCH AREAS CAUTION SHOULD BE EXERCISED THAT THE DIMENSION TO THE INVERT OF CONCRETE OF GUIDEWAY IS NEVER LESS THAN THAT SHOWN FOR INVERT DETAILS.
- 6. ALL CONSTRUCTION JOINTS IN EARTH RETAINING STRUCTURES AND IN STRUCTURES BELOW THE FINISH GRADE SHALL CONTAIN CONTINUOUS WATERSTOPS, AND SHALL HAVE REINFORCEMENT CONTINUOUS ACROSS ALL JOINTS. HYDROSWELLING STRIPS SHALL BE INSTALLED ON ALL JOINT SURFACES WHICH WILL BE EXPOSED TO EARTH AND PERMANENTLY UNDER THE GROUNDWATER ELEVATION.
- 7. ALL WATERSTOPS SHALL BE INSTALLED SECURELY IN ACCORDANCE WITH THE SPECIFICATIONS. THE WATERSTOPS SHALL BE PLACED CONTINUOUSLY THROUGHOUT THE LENGTH OF THE CONSTRUCTION JOINT. LAPPING OF WATERSTOPS SHALL NOT BE PERMITTED. SPLICING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
- 8. UNLESS INDICATED OTHERWISE, CONCRETE SURFACES LEADING TO DRAINS SHALL BE SLOPED A MINIMUM OF 1/8 INCH PER FOOT TOWARD THE DRAIN AND THE ADJACENT SURFACES WARPED AS REQUIRED TO SATISFY AN ADEQUATE DRAINAGE FLOW.
- 9. CAST-IN-PLACE CONCRETE DECKS ON PRECAST CONCRETE GIRDERS OR STEEL GIRDERS OF PRIMARY TYPE 1, PRIMARY TYPE 2 AND SECONDARY STRUCTURES SHALL HAVE A SHRINKAGE VALUE OF 0.025 PERCENT OR LESS WHEN MEASURED AT 28 DAYS AND OF 0.035 PERCENT OR LESS WHEN MEASURED AT 180 DAYS IN ACCORDANCE WITH ASTM C157, STANDARD TEST METHOD FOR LENGTH CHANGE OR HARDENED HYDRAULIC-CEMENT MORTAR AND CONCRETE. CRACK CONTROL OF THESE DECKS MAY BE ACHIEVED THROUGH USE OF MATERIALS SUCH AS SHRINKAGE REDUCING ADMIXTURE (SRA), SYNTHETIC FIBER REINFORCEMENT AND WATER-REDUCING ADMIXTURE.

D. MATERIAL PROPERTIES

- 1. CONCRETE 28 DAY COMPRESSIVE STRENGTH (MINIMUM)
  - a) DRILLED SHAFTS: f'c=4,000 PSI
  - b) PRECAST-PRESTRESSED PILES: f'c=6,000 PSI
  - c) FORMED CAST-IN-PLACE STRUCTURAL CONCRETE:
    - f'c (UNDER GROUND)=4000 PSI
    - f'c (ABOVE GROUND)=5000 PSI
  - d) PRECAST GIRDERS OR SEGMENTS OF GIRDERS: f'c=6,000 PSI
  - e) UNLESS NOTED OTHERWISE ON THE DRAWINGS, OR SPECIFIED, MINIMUM STRUCTURAL CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI.
  - f) ALL EXPOSED CONCRETE EDGES AND CORNERS SHALL BE CHAMFERED WITH A 3/4 INCH, 45 DEGREE CHAMFER UNLESS NOTED OTHERWISE.
- 2. REINFORCING STEEL SHALL CONFORM TO THE SPECIFICATIONS OF ASTM A 706 GRADE 60.

3. PRESTRESSING STEEL

- a) STRAND: ASTM A416/AASHTO M203, GRADE 270, LOW RELAXATION FRICTION COEFFICIENT: 0.25 WOBBLE COEFFICIENT: 0.0002 PER FT ANCHOR SET: 0.375" APPARENT MODULUS: 28,500 KSI MINIMUM JACKING STRESS: 216 KSI (80% ULTIMATE) MAXIMUM ANCHORING STRESS: 189 KSI (70% ULTIMATE) MAXIMUM STRESS AFTER ANCHOR SET: 202 KSI (75% ULTIMATE) STRAND DIAMETER: 0.6" (AREA=0.216 SQ IN)
- b) POST TENSIONING BARS: ASTM A722/AASHTO M275, GRADE 150, TYPE II ANCHOR SET: 0.0625" APPARENT MODULUS: 30,000 KSI MINIMUM JACKING STRESS: 113 KSI MAXIMUM ANCHORING STRESS: 105 KSI MAXIMUM STRESS AFTER LOSSES: 96 KSI

4. STRUCTURAL STEEL SHAPES SHALL CONFORM TO ASTM A6 WITH A YIELD STRENGTH OF FY = 50 KSI UNLESS NOTED OTHERWISE. THE FOLLOWING MATERIAL PROPERTIES SHALL APPLY:

- a) WIDE FLANGE SHAPES: ASTM A992
- b) M-SHAPES, S-SHAPES, HP SHAPES: ASTM A572
- c) ANGLES, CHANNELS: ASTM A572
- d) RECTANGULAR AND SQUARE HSS: ASTM A500 GR B (46 KSI)
- e) ROUND HSS: ASTM A500 GR B (42 KSI)
- f) STEEL PIPE: ASTM A53 GR B (35 KSI)
- g) PLATES, BARS: ASTM A36 (36 KSI)
- h) BOLTS: ASTM A325
- i) NUTS: ASTM A563
- j) WASHERS: ASTM F436

5. STEEL FABRICATIONS

- a) WELDING OF BUILT UP MEMBERS AND STEEL FABRICATIONS SHALL COMPLY WITH AASHTO/AWS D 1.5
- b) WELDING OF HSS SECTIONS AND PIPES SHALL COMPLY WITH AWS D 1.1
- c) MISCELLANEOUS STEEL ITEMS SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION UNLESS COMPLETELY EMBEDDED IN CONCRETE AND UNLESS NOTED OTHERWISE.

6. FASTENERS

- a) ALL HIGH STRENGTH BOLTS NUTS AND WASHERS SHALL BE ZINC COATED
- b) ALL BOLTED CONNECTIONS SHALL COMPLY WITH RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS (RCSC) "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS".
- c) ALL BOLTS ARE ASTM A325 HIGH STRENGTH SLIP CRITICAL WITH THREADS EXCLUDED FROM THE SHEAR PLANE

E. CONCRETE COVER

- 1. UNLESS OTHERWISE NOTED, MINIMUM CONCRETE COVER SHALL CONFORM TO AASHTO LRFD WITH CALTRANS AMENDMENTS TABLE 5.12.3-1 WITH THE FOLLOWING EXCEPTIONS:
  - a) UNCASSED DRILLED SHAFTS: 6 INCHES
  - b) CASSED DRILLED SHAFTS WITH TEMPORARY CASING: 4 INCHES

F. SEISMIC LOADING AND DESIGN

- 1. THERE ARE TWO LEVELS OF DESIGN EARTHQUAKES:
  - a) MAXIMUM CONSIDERED EARTHQUAKE (MCE): GROUND MOTIONS CORRESPONDING TO GREATER OF (1) A PROBABILISTIC SPECTRUM BASED UPON A 10% PROBABILITY OF EXCEEDANCE IN 100 YEARS (i.e., A RETURN PERIOD OF 950 YEARS) AND (2) A DETERMINISTIC SPECTRUM BASED UPON THE LARGEST MEDIAN RESPONSE RESULTING FROM THE MAXIMUM RUPTURE (CORRESPONDING TO M ) OF ANY FAULT IN THE VICINITY OF THE STRUCTURE.
  - b) OPERATING BASIS EARTHQUAKE (OBE): GROUND MOTIONS CORRESPONDING TO A PROBABILISTIC SPECTRUM BASED UPON AN 86% PROBABILITY OF EXCEEDANCE IN 100 YEARS (i.e., A RETURN PERIOD OF 50 YEARS).

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY R. MINCIO
CHECKED BY T. JACKSON
IN CHARGE J. CHIRCO
DATE 04/17/2015



CALIFORNIA HIGH-SPEED TRAIN PROJECT  
GENERAL DIRECTIVE

GENERAL DIRECTIVE NOTES  
STRUCTURAL

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A		B CONTINUED		C CONTINUED		D	
@	AT	BCR	BEGIN CURB RETURN	CEM	CEMENT	D	DEPTH
A&E	ARCHITECTURAL AND ENGINEERING	BD	BOARD	CER	COMMUNICATIONS EQUIPMENT ROOM	DB	DESIGN-BUILD
A/G	AT-GRADE	BDA	BI-DIRECTIONAL AMPLIFIER	C&G	CURB & GUTTER	DBE	DESIGN BASIS EARTHQUAKE
AADT	AVERAGE ANNUAL DAILY TRAFFIC	BDD	BRIDGE DESIGN DETAILS (CALTRANS)	CG	CENTER OF GRAVITY	DBL	DOUBLE
AB	AGGREGATE BASE, ANCHOR BOLT	BDP	BRIDGE DESIGN PRACTICE (CALTRANS)	CGS	CALIFORNIA GEOLOGICAL SURVEY	DC	DIRECT CURRENT
ABBC	ASBESTOS BONDED BITUMINOUS COATED	BDS	BRIDGE DESIGN SPECIFICATIONS (CALTRANS)	CHNL	CHANNEL	DCMB	Dc DISTRIBUTION PANEL MAIN BREAKER
ABM	AIR-BLOWN MORTAR	BEC	BURIED EARTH (GROUND) CONDUCTOR	CI	CAST IRON	DCP	Dc DISTRIBUTION PANEL
ABN	ABANDON	BEG	BEGIN	CIC	COMMUNICATIONS INTERFACE CABINET	DD	DOWNDRAIN,
ABUT	ABUTMENT	BFA	BY PASS FEEDER ANCHOR	CIDH	CAST-IN-DRILLED-HOLE	DE	DEVICE DRIVER
ABV	ABOVE	BIL	BASIC IMPULSE INSULATION LEVEL	CIF	COMMON INTERMEDIATE FORMAT	DEL	DEAD END
AC	ALTERNATING CURRENT, ASPHALT CONCRETE	BITUM	BITUMINOUS	CIP	CAST IRON PIPE	DEMO	DELINEATOR
	ASPHALT CONCRETE BASE	BK	BACK	C-I-P	CAST-IN-PLACE	DEPT	DEMOLISH
ACB	ASPHALT CONCRETE BASE	BKF	BACKFILL	CIPCP	CAST-IN-PLACE CONCRETE PIPE	DET	DEPARTMENT
ACMB	AC DISTRIBUTION PANEL MAIN BREAKER	BKR	BREAKER	CIS	CUSTOMER INFORMATION SIGN	DF	DETOUR
ACOUS	ACOUSTICAL	BL	BASE LINE	CISS	CAST-IN-STEEL-SHELL		DIRECT FIXATION,
ACP	ASBESTOS CEMENT PIPE	BLDG	BUILDING	CJ	CONSTRUCTION JOINT		DRINKING FOUNTAIN
ACS	ACCESS CONTROL ROOM	BLKG	BLOCKING	CJP	COMPLETE JOINT PENETRATION		DOWN GUY ANCHOR
ACSR	ALUMINUM CONDUCTOR STEEL REINFORCED	BLM	BRIDGE-LOG MILE	CKT	CIRCUIT	DGA	DESIGN HOURLY VOLUME
AD	AREA DRAIN, ACCESS DETERRING	BLST	BALLAST	CL	CLASS	DHV	DRAINAGE INLET
	ADJACENT,	BLVD	BOULEVARD	CL2	CLASS 2	DI	DIAGONAL
ADJ	ADJUST,	BM	BENCH MARK	CL-6	CHAIN LINK FENCE (6 FT)	DIAPH	DIAPHRAGM
	ADJUSTABLE	BN	BACKBONE NETWORK	CLG	CEILING	DIFF	DIFFERENTIAL
ADL	ADDED DEAD LOAD	BND	BOUND	CLK	CHAIN LINK	DIM	DIMENSION
ADP	AC DISTRIBUTION PANEL	BOC	BOTTOM OF CURB	CLKG	CAULKING	DIN	DROP INLET
ADT	AVERAGE DAILY TRAFFIC	BOCC	BACK-UP OPERATIONAL CONTROL CENTER	CLO	CLOSET	DIR	DIRECTION
AEC	AERIAL EARTH (GROUND) CONDUCTOR	BOS	BOTTOM OF SLOPE	CLR	CLEAR,	DISC	DISCONNECT
AED	AUTOMATED EXTERNAL DEFIBRILLATOR	BOT	BOTTOM		CLEARANCE	DISP	DISPENSER
AFC	AUTOMATIC FARE COLLECTION	BOW	BOTTOM OF WALL	CM	CONTROL MODULE,	DIST	DISTANCE
AFES	ALTERNATIVE FLARED END SECTION	BR	BRIDGE		CORRUGATED METAL	DISTR	DISTRIBUTION
AGW	AERIAL GROUND WIRE	BRG	BEARING	CMF	CORRUGATED METAL PIPE	DMBB	DOUBLE METAL BEAM BARRIER
AHD	AHEAD	BRKT	BRACKET	CMU	CONCRETE MASONRY UNIT	DN	DOWN
AL	ALUMINUM	BRS	BROADBAND RADIO SYSTEM	CNTR	COUNTER	DNS	DOMAIN NAME SYSTEM
ALIGN	ALIGNMENT	BRT	BUS RAPID TRANSIT	CO	CLEANOUT,	DO	DOOR OPENING
ALT	ALTERNATE	BS	BODY SPAN WIRE		COUNTY	DPDT	DOUBLE-POLE DOUBLE-THROW
AM	TIME FROM MIDNIGHT TO NOON	BSC	BASE STATION CONTROLLER	COL	COLUMN	DR	DRIVE
ANC	ANCHOR	BT	BUS TIE	COMM	COMMUNICATIONS	DS	DOWNSPOUT,
ANI	AUTOMATIC NUMBER IDENTIFICATION	BTM	BOTTOM	CONC	CONCRETE		DISCONNECT SWITCH
ANN	ANNUNCIATOR	BTS	BASE TRANSCEIVER STATION	COND	CONDUIT	DSC	DIFFERING SITE CONDITIONS
ANS	AMBIENT NOISE SENSOR	BTWN	BETWEEN	CONN	CONNECTOR,	DSCW	DIRECT SUSPENSION CONTACT WIRE
AP	ALTERNATIVE PIPE	BW	BARBED WIRE,		CONNECTION	DSG	DISCONNECT SWITCH GROUP
APC	ALTERNATIVE PIPE CULVERT		BALANCE WEIGHT	CONST	CONSTRUCT,	DSHA	DETERMINISTIC SEISMIC HAZARD ANALYSIS
APE	AREA OF POTENTIAL EFFECTS	BWA	BALANCE WEIGHT ANCHOR		CONSTRUCTION	DST	DISTRICT
APEFZ	ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE	BWLAN	BROADBAND WIRELESS LOCAL AREA NETWORK	CONT	CONTINUOUS,	DTBB	DOUBLE THRIE BEAM BARRIER
API	APPLICATION PROGRAMMING INTERFACE	BZ	BRONZE		CONTINUATION	DTM	DIGITAL TERRAIN MODEL
APPROX	APPROXIMATE			CONTR	CONTRACTOR	DVR	DIGITAL VIDEO RECORDERS
APU	ALTERNATIVE PIPE UNDERDRAIN			COORD	COORDINATE	DWG	DRAWING
AR	ACCESS RESTRICTION			CORR	CORRIDOR	DWY	DRIVEWAY
ARCH	ARCHITECTURAL			CP	CONTROL POINT	DXO	DOUBLE CROSSOVER
ARS	ACCELERATION RESPONSE SPECTRUM			CPT	CONE PENETRATION TEST,		
AS	AGGREGATE SUBBASE				CONTROL POWER TRANSFORMER		
ASPH	ASPHALT			CPU	CENTRAL PROCESSING UNIT		
ASRP	ALUMINUM SPIRAL RIB PIPE			CR	CREEK,		
ASSY	ASSEMBLY				CONDUIT RISER		
AT	AUTOTRANSFORMER,			CRB	COMBINED RELAY AND CONTROL PANEL	E	EAST
	AUTOMATIC TENSION	CA	CERTIFICATION ACCEPTANCE	CRCP	CONTINUOUS REINFORCED CONCRETE PAVEMENT	EA	EACH
ATC	AUTOMATIC TRAIN CONTROL	CAA	CABLE ANCHOR ASSEMBLY	CRSP	CONCRETED ROCK SLOPE PROTECTION	EB	EASTBOUND,
ATEL	ADMINISTRATIVE TELEPHONE	CAB	CABINET	CRZ	CLEAR RECOVERY ZONE		END OF BRIDGE
ATM	ALONG TRACK MOVEMENT	CADD	COMPUTER-AIDED DESIGN AND DRAFTING	CS	CONTROL SWITCH	EC	END HORIZONTAL CURVE,
ATO	AUTOMATIC TRAIN OPERATION	CAH	CONTROLLED ACCESS HIGHWAY	CSA	CONSTRUCTION STAGING AREA		ELECTRICAL CONDUCTOR
ATP	AUTOMATIC TRAIN PROTECTION	CAI	CUSTOMER ASSISTANCE INTERCOM	CSP	CORRUGATED STEEL PIPE		END CURB RETURN
ATPB	ASPHALT TREATED PERMEABLE BASE	CALP	CORRUGATED ALUMINUM PIPE	CSPA	CORRUGATED STEEL PIPE ARCH	ECR	EACH END
ATPM	ASPHALT TREATED PERMEABLE MATERIAL	CANT	CANTILEVER	CT	CERAMIC TILE,	EE	EACH FACE
ATR	ABOVE TOP OF RAIL	CAP	CAPACITY,		COURT,	EF	EMERGENCY GROUND SWITCH
ATS	AUTOMATIC TRAIN SUPERVISION,		CAPACITOR,		CURRENT TRANSFORMER/TRANSDUCER	EGS	EXTRA HIGH STRENGTH
	AUTOTENSIONED SYSTEM		CORRUGATED ALUMINUM PIPE	CTB	CEMENT TREATED BASE	EHS	EMERGENCY INTERCOM
AUX	AUXILIARY	CAPA	CORRUGATED ALUMINUM PIPE ARCH	CTPB	CEMENT TREATED PERMEABLE BASE	EI	EXPANSION JOINT
AVE	AVENUE	CAS	CONSTRUCTION AREA SIGN	CTPM	CEMENT TREATED PERMEABLE MATERIAL	EJ	ETHERNET LAN
AVG	AVERAGE	CAT	CATEGORY,	CTR	CENTER	E-LAN	ELASTOMERIC
AVL	AUTOMATIC VEHICLE LOCATION		CATEGORY SPECIFICATION FOR	CTSK	COUNTERSUNK	ELAST	ELECTRICAL,
AWG	AMERICAN WIRE GAUGE		TWISTED PAIR CABLING,	CTVT	COMBINED CURRENT TRANSFORMER AND	ELEC	ELECTRIC
			CATENARY		VOLTAGE TRANSFORMER		ELECTROLIER
		CATF	CANTENARY FOUNDATION		COUNTERWEIGHT TAIL WIRE	ELECT	ELEVATION
		CATP	CATENARY POLE	CTW	COPPER	ELOCK	ELECTRONIC LOCK
		CB	CATCH BASIN,	CULV	CULVERT	EMB	EMBANKMENT
			CIRCUIT BREAKER	CV	CURVE	EMC	ELECTROMAGNETIC COMPATIBILITY
			CONCRETE BARRIER	CVR	COVER	EMER	EMERGENCY
		CBTC	COMMUNICATIONS BASED TRAIN CONTROL	CW	CONTACT WIRE	EMI	ELECTROMAGNETIC FIELD
		CBW	CONCRETE BLOCK WALL	CWA	CONTACT WIRE ANCHOR	EMS	ELECTRO MAGNETIC INTERFERENCE
B/SPAN	BODY SPAN	C-C	CENTER LINE TO CENTER LINE	CWH	CONTACT WIRE HEIGHT	EMU	ELEMENT MANAGEMENT SYSTEM
B/W	BLACK & WHITE	CCO	CONTRACT CHANGE ORDER	CWR	CONTINUOUSLY WELDED RAIL	ENCL	ELECTRIC MULTIPLE UNIT
BAGR	BRIDGE APPROACH GUARD RAILING	CCS	CALIFORNIA COORDINATE SYSTEM	CWT	COUNTER WEIGHT	ENGR	ENCLOSURE
BAR	BARRIER	CCTV	CLOSED CIRCUIT TELEVISION				ENGINEER,
BAT	BATTERY	CCVT	COUPLING CAPACITOR VOLTAGE TRANSFORMER				ENGINEERING
BB	BEGINNING OF BRIDGE	CEG	CERTIFIED ENGINEERING GEOLOGIST				END OF BRIDGE
B-B	BACK-TO-BACK						
BC	BOLT CIRCLE						

B		C		E	
B/SPAN	BODY SPAN	C	CLOSE,	E	EAST
B/W	BLACK & WHITE		CONTACT,	EA	EACH
BAGR	BRIDGE APPROACH GUARD RAILING		CONTROL	EB	EASTBOUND,
BAR	BARRIER	CA	CERTIFICATION ACCEPTANCE		END OF BRIDGE
BAT	BATTERY	CAA	CABLE ANCHOR ASSEMBLY	EC	END HORIZONTAL CURVE,
BB	BEGINNING OF BRIDGE	CAB	CABINET		ELECTRICAL CONDUCTOR
B-B	BACK-TO-BACK	CADD	COMPUTER-AIDED DESIGN AND DRAFTING	ECR	END CURB RETURN
BC	BOLT CIRCLE	CAH	CONTROLLED ACCESS HIGHWAY	EE	EACH END
		CAI	CUSTOMER ASSISTANCE INTERCOM	EF	EACH FACE
		CALP	CORRUGATED ALUMINUM PIPE	EGS	EMERGENCY GROUND SWITCH
		CANT	CANTILEVER	EHS	EXTRA HIGH STRENGTH
		CAP	CAPACITY,	EI	EMERGENCY INTERCOM
			CAPACITOR,	EJ	EXPANSION JOINT
			CORRUGATED ALUMINUM PIPE	E-LAN	ETHERNET LAN
			CORRUGATED ALUMINUM PIPE ARCH	ELAST	ELASTOMERIC
		CAPA	CONSTRUCTION AREA SIGN	ELEC	ELECTRICAL,
		CAS	CATEGORY,		ELECTRIC
		CAT	CATEGORY SPECIFICATION FOR		ELECTROLIER
			TWISTED PAIR CABLING,		ELEVATION
			CATENARY		ELECTRONIC LOCK
		CATF	CANTENARY FOUNDATION		EMBANKMENT
		CATP	CATENARY POLE		ELECTROMAGNETIC COMPATIBILITY
		CB	CATCH BASIN,		EMERGENCY
			CIRCUIT BREAKER		ELECTROMAGNETIC FIELD
			CONCRETE BARRIER		ELECTRO MAGNETIC INTERFERENCE
		CBTC	COMMUNICATIONS BASED TRAIN CONTROL		ELEMENT MANAGEMENT SYSTEM
		CBW	CONCRETE BLOCK WALL		ELECTRIC MULTIPLE UNIT
		C-C	CENTER LINE TO CENTER LINE		ENCLOSURE
		CCO	CONTRACT CHANGE ORDER		ENGINEER,
		CCS	CALIFORNIA COORDINATE SYSTEM		ENGINEERING
		CCTV	CLOSED CIRCUIT TELEVISION		END OF BRIDGE
		CCVT	COUPLING CAPACITOR VOLTAGE TRANSFORMER		
		CEG	CERTIFIED ENGINEERING GEOLOGIST		

E	
E	EAST
EA	EACH
EB	EASTBOUND,
	END OF BRIDGE
EC	END HORIZONTAL CURVE,
	ELECTRICAL CONDUCTOR
	END CURB RETURN
ECR	EACH END
EE	EACH FACE
EF	EMERGENCY GROUND SWITCH
EGS	EXTRA HIGH STRENGTH
EHS	EMERGENCY INTERCOM
EI	EXPANSION JOINT
EJ	ETHERNET LAN
E-LAN	ELASTOMERIC
ELAST	ELECTRICAL,
ELEC	ELECTRIC
	ELECTROLIER
ELECT	ELEVATION
ELOCK	ELECTRONIC LOCK
EMB	EMBANKMENT
EMC	ELECTROMAGNETIC COMPATIBILITY
EMER	EMERGENCY
EMI	ELECTROMAGNETIC FIELD
EMS	ELECTRO MAGNETIC INTERFERENCE
EMU	ELEMENT MANAGEMENT SYSTEM
ENCL	ELECTRIC MULTIPLE UNIT
ENGR	ENCLOSURE
	ENGINEER,
	ENGINEERING
EOB	END OF BRIDGE

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E CONTINUED

EOD EDGE OF DECK  
EOS ELECTRICAL OPERATED SWITCH  
EOW END OF WALL  
EP EDGE OF PAVEMENT  
EPBM EARTH PRESSURE BALANCING MACHINE  
EPR ETHYLENE PROPYLENE RUBBER  
EQ EQUAL,  
EQUILATERAL  
EQN EQUATION  
EQUIP EQUIPMENT  
ES EDGE OF SHOULDER,  
EXTRA STRENGTH,  
ELECTRICAL SECTION  
ENVIRONMENTALLY SENSITIVE AREA  
ESCA ESCALATOR  
ESEW EMERGENCY SHOWER / EYE WASH  
ESMT EASEMENT  
ETCS EUROPEAN TRAIN CONTROL SYSTEM  
ETEL EMERGENCY TELEPHONE  
ETS EMERGENCY TRIP SYSTEM  
ETW EDGE OF TRAVELED WAY  
EW EACH WAY,  
ENDWALL  
EXC EXCAVATION  
EXIST EXISTING  
EXP EXPANSION  
EXPO EXPOSED  
EXWY EXPRESSWAY  
EXT EXTERIOR

F

F/F FACE TO FACE  
F&C FRAME AND COVER  
F&G FRAME AND GRATE  
FA FIRE ALARM  
FACP FIRE ALARM CONTROL PANEL  
FAS FIRE ALARM SYSTEM  
FB FLAT BAR,  
FLOOR BEAM,  
FEEDER BREAKER  
FURNISHED BY OTHERS  
FC FARE COLLECTION  
FD FLOOR DRAIN  
FDC FIRE DEPARTMENT CONNECTION  
FDN FOUNDATION  
FDP FIBER DISTRIBUTION PANEL  
FDR FEEDER  
FDU FIBER DISTRIBUTION UNIT  
FE FIRE EXTINGUISHER  
FES FLARED END SECTION  
FF FILTER FABRIC  
FFJ FULL FEEDING JUMPER  
FFL FINISHED FLOOR LEVEL  
FG FINISHED GRADE  
FH FIRE HYDRANT  
FHC FIRE HOSE CABINET  
FID FIRE INITIATING DEVICE  
FIG FIGURE  
FIN FINISH  
FIRM FLOOD INSURANCE RATE MAPS  
FJ FEEDER JUMPER  
FL FLOW LINE  
FLB FLOOR BEAM  
FLH FLAT HEAD  
FLR FLOOR  
FNA FIRE NOTIFICATION APPLIANCE  
FO FIBER OPTIC  
FOC FIBER OPTIC CABLE,  
FACE OF CURB  
FOCN FIBER OPTIC CABLING NETWORK  
FOF FACE OF FINISH  
FOP FACE OF POLE  
FOS FACE OF STUDS,  
FACTOR OF SAFETY  
FP FULL PENETRATION  
FPLM FULL SPAN PRECAST LAUNCHING  
FPRF FIREPROOF  
FPS FRAMES PER SECOND  
FR FRAME  
FREQ FREQUENCY  
FS FINISHED SURFACE

F CONTINUED

FTEL FIRE TELEPHONE  
FTG FOOTING  
FTP FILE TRANSFER PROTOCOL  
FTW FIXED END TAIL WIRE  
FUT FUTURE  
FW FEEDER WIRE  
FWY FREEWAY  
G1 ENTRANCE GRADE  
G2 EXIT GRADE  
G/L GROUND LINE  
GALV GALVANIZED  
GCL GRADING CONTROL LINE  
GD GRADE  
GHS GALVANIZED HIGH STRENGTH  
GIGE GIGABIT ETHERNET  
GIS GAS INSULATED SWITCH,  
GEOGRAPHIC INFORMATION SYSTEM  
GL GLASS  
GMA GROUND MOTION ANALYSIS  
GND GROUND  
GO-95 PUC GENERAL ORDER 95  
GP GRADING PLANE  
GPS GLOBAL POSITIONING SYSTEM  
GR GUARDRAIL,  
GROUND ROD  
GRP GLASS REINFORCED PLASTIC ROD  
GRS GALVANIZED RIGID STEEL  
GRX GRADE CROSSING  
GSHA GEOLOGIC AND SEISMIC HAZARDS  
ANALYSIS  
GSP GALVANIZED STEEL PIPE  
GT GENERAL INFORMATION  
GTGM GEOTECHNICAL TECHNICAL GUIDANCE  
MANUAL (FHWA)  
GTR GUTTER  
GW GUY WIRE  
GYP GYPSUM  
GYPBD GYPSUM BOARD

H

H/SPAN HEADSPAN  
HAZ HAZARDOUS  
HB HARDNESS BRINELL,  
HOSE BIBB  
HC HANDICAP  
HD HARD DRAWN,  
HORIZONTAL DRAIN  
HDG HOT DIP GALVANIZED  
HDPE HIGH DENSITY POLYETHYLENE  
HDWE HARDWARE  
HDWL HEADWALL  
HEX HEXAGONAL  
HH HANDHOLE,  
HEAD HARDENED  
HI HIGH  
HI-RAIL HIGHWAY TO RAILROAD VEHICLE  
HM HOLLOW METAL  
HMA HOT MIXED ASPHALT  
HMI HUMAN MACHINE INTERFACE  
HO HAND OPERATED  
HOR HORIZONTAL  
HOV HIGH-OCCUPANCY VEHICLE  
HP HIGH POINT,  
HINGE POINT  
HP&R HIGHWAY PLANTING AND RESTORATION  
HPS HIGH PERFORMANCE STEEL  
HR HANDRAIL  
HRL HIGH RAIL LEVEL  
HS HIGH STRENGTH  
HSR HIGH-SPEED RAIL  
HST HIGH-SPEED TRAIN  
HT HIGH TEMPERATURE  
HTR HEATER  
HV HIGH VOLTAGE

H CONTINUED

HVAC HEATING VENTILATION AND AIR CONDITIONING  
HW HIGH WATER  
HWM HIGH WATER MARK  
HWY HIGHWAY  
I/O INPUT/OUTPUT  
IB IMPEDANCE BOND  
IBC INTERNATIONAL BUILDING CODE  
IDS INTRUSTION DETECTION CODE  
IIMP INTEGRATED INFORMATION MANAGEMENT PLATFORM  
IJ INSULATED JOINT  
IJP INSULATED JOINT PLUG  
INSR INSULATOR  
INST INSTANTANEOUS  
INSUL INSULATION  
INT INTERIOR  
Inter-LATA INTER-LOCAL ACCESS AND TRANSPORT  
AREA  
INV INVERT  
IR IN-RUNNING (RIDING CONTACT WIRE)  
IRR IRRIGATION  
I/S IN-SPAN  
I/SJ IN-SPAN JUMPER

I

J JUMPER  
JAN JANITOR  
JB JUNCTION BOX  
JCT JUNCTION  
JP JOINT POLE  
JT(S) JOINT(S)

L

LA LANDSCAPE ARCHITECT,  
LIGHTNING ARRESTER  
LAM LAMINATE  
LAN LOCAL AREA NETWORK  
LAT LATITUDE  
LAV LAVATORY  
LC LANDSCAPE CONTRACTOR  
LCB LEAN CONCRETE BASE  
LCX LOWER-LEVEL DESIGN BASIS EARTHQUAKE  
LDBE LEAKY COAXIAL RADIO CABLE  
LED LIGHT EMITTING DIODE  
LF LINEAR FEET  
LG LONG  
LGT LIGHT,  
LIGHTING  
LH LEFT-HAND  
LKR LOCKER  
LL LIGHT LOADING  
LLT LAST LONG TIE  
LN LANE  
LO LOCKOUT  
LOC LOCATION  
LOL LAYOUT LINE  
LONG LONGITUDE,  
LONGITUDINAL  
LOS LEVEL OF SERVICE  
LOTB LOGS OF TEST BORINGS  
LP LOW POINT,  
LOW PROFILE  
LPL LIGHT POLE  
LR LOW RAIL  
LRFD LOAD AND RESISTANCE FACTOR DESIGN  
LRT LIGHT RAIL TRANSIT  
LRV LIGHT RAIL VEHICLE  
LS LANDSCAPING,  
LUMP SUM  
LT LEFT  
LV LOW VOLTAGE  
LVL LEVEL  
LVT LOW VIBRATION TRACK  
LWP LOWER WORKING POINT

M

M MEDIUM LOADING  
MAINT MAINTENANCE  
MAT MATERIAL  
MAX MAXIMUM  
MB METAL BEAM  
MBB METAL BEAM BARRIER  
MBGR METAL BEAM GUARD RAILING  
MCC MAINTENANCE CONTROL CENTER  
MCE MAXIMUM CONSIDERED EARTHQUAKE  
MCR MASTER CONTROL ROOM  
MDS MOBILE DATA SYSTEM  
MECH MECHANICAL  
MED MEDIAN  
MEM MEMBRANE  
MESSGR MESSENGER WIRE  
MET METAL  
MFR MANUFACTURER  
MH MANHOLE  
MHHW MEAN HIGHEST HIGH WATER  
MI MILD IRON  
MIN MINIMUM  
MISC MISCELLANEOUS  
MKR MARKER  
ML MAIN LINE  
MLLW MEAN LOWER LOW WATER  
MMIS MAINTENANCE MANAGEMENT INFORMATION SYSTEM  
MO MASONRY OPENING  
MOC MOTOR OPERATED CONTRACTOR  
MOD MODIFIED,  
MODIFY  
MODC MOTOR OPERATED DISCONNECT SWITCH  
MOI MAINTENANCE OF INFRASTRUCTURE  
MON MONUMENT  
MOP MOTOR OPERATED  
MOS MANUALLY OPERATED SWITCH  
MOV METAL-OXIDE VARISTOR  
MOW MAINTENANCE OF WAY  
MP MILEPOST  
MPA MIDPOINT ANCHOR  
MPLS MULTI-PROTOCOL LABEL SWITCHING  
MR MOVEMENT RATING  
MSE MECHANICALLY STABILIZED EMBANKMENT  
MSF MAINTENANCE AND STORAGE FACILITY  
MSL MEAN SEA LEVEL  
MTD MEMO TO DESIGNERS (CALTRANS),  
MOUNTED  
MULLION  
MVC MINIMUM VERTICLE CLEARANCE  
MW MESSENGER WIRE

N

N NORTH  
N/A NOT APPLICABLE  
NAVD NORTH AMERICAN VERTICAL DATUM  
NB NORTHBOUND  
NBR NONBRIDGING  
NCL NO COLLAPSE PERFORMANCE LEVEL  
NDP NONLINEAR DYNAMIC PROCEDURE  
NEC NATIONAL ELECTRICAL CODE  
NEG NEGATIVE  
NEUT NEUTRAL  
NF NEGATIVE FEEDER,  
NEAR FACE  
NGVD NATIONAL GEODETIC VERTICAL DATUM  
NI NETWORK INTERFACE  
NIC NOT IN CONTRACT  
NMS NETWORK MANAGEMENT SYSTEM  
NO. NUMBER  
NO NORMALLY OPEN  
NOM NOMINAL  
NP NETWORK PORT  
NPRM NOTICE OF PROPOSED RULE MAKING  
NPS NOMINAL PIPE SIZE  
NR NOT REGISTERED  
NS NOT SUPPORTED  
NT NETWORK  
NTP NETWORK TIME PROTOCOL,  
NOTICE TO PROCEED  
NTS NETWORK TIME SERVER,  
NOT TO SCALE

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DIRECTIVE DRAWING

ACRONYMS AND ABBREVIATIONS 2

CONTRACT NO.

DRAWING NO.  
DD-GE-101

SCALE  
NO SCALE

SHEET NO.

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

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01/24/2014

REV	DATE	BY	CHK	APP	DESCRIPTION

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O&M OPERATIONS AND MAINTENANCE  
OA OVERALL  
OBLR OBLITERATE  
OC ON CENTER,  
OVERCROSSING  
OCC OPERATIONS CONTROL CENTER  
OCS OVERHEAD CONTACT SYSTEM  
OF OUTSIDE FACE  
OFF OFFSET  
OG ORIGINAL GROUND  
OH OVERHEAD  
O-O OUT TO OUT  
OOR OUT-OF-RUNNING (NONRIDING CONTACT WIRE)  
OP OVERPASS  
OPL OPERABILITY PERFORMANCE LEVEL  
OPNG OPENING  
OPP OPPOSITE  
ORS OPERATIONS RADIO SYSTEM  
OSP OUTSIDE PLANT  
OVERTEMP OVERTEMPERATURE

P/L PROPERTY LINE  
PA PUBLIC ADDRESS  
PACIS PUBIC ADDRESS / CUSTOMER INFORMATION SYSTEM  
PAN PANTOGRAPH  
PAP PERFORATED ALUMINUM PIPE  
PB PULL BOX,  
PUSH BUTT (ON ELECTRICAL DIAGRAMS)  
PBX PRIVATE BRANCH EXCHANGE  
PC PRECAST CONCRETE  
PCC PORTLAND CEMENT CONCRETE  
PCP PERFORATED CONCRETE PIPE  
PCPT PIEZOCON PENETROMETER TEST  
PE PORCELAIN ENAMEL  
PED PEDESTRIAN  
PERF PERFORATED  
PERM PERMEABLE  
PET POTENTIAL EQUALIZING JUMPER  
PF POWER FACTOR  
PFDHA PROBABILISTIC FAULT DISPLACEMENT  
HAZARD ANALYSIS  
PG PROFILE GRADE  
PH PHASE  
PHE POTHOLE  
PID PASSENGER INFORMATION DISPLAY  
PITO POINT OF INTERSECTION TURNOUT  
PJP PARTIAL JOINT PENETRATION  
PL PLATE  
PLAM PLASTIC LAMINATE  
PLAS PLASTER  
PLC PROGRAMMABLE LOGIC CONTROLLER  
PLYWD PLYWOOD  
PM POST MILE,  
TIME FROM NOON TO MIDNIGHT  
PMS PAVEMENT MANAGEMENT SYSTEM  
PN PAVING NOTCH  
PNL PANEL  
PNT POINT  
PO PULL OFF  
POC POINT OF CONNECTION  
POE POINT OF ENDING  
POS POSITIVE  
POTS PLAIN ORDINARY TELEPHONE SERVICE  
PP PLASTIC PIPE,  
POWER POLE  
PPL PREFORMED PERMEABLE LINER  
PPP PERFORATED PLASTIC PIPE  
PR PAIR  
PRI PRIMARY RATE INTERFACE (ISDN SERVICE)  
PROP PROPOSED  
PS PARALLELING STATION  
P/S PRESTRESSED,  
PERFORATED STEEL PIPE  
PSP PRODUCT SAFETY PLAN  
PSTN PUBLIC SWITCHED TELEPHONE NETWORK  
PSTWS PUBLIC SAFETY TRENCH AND  
TUNNEL WIRELESS SYSTEM  
PSU POWER SUPPLY UNIT  
PT POTENTIAL TRANSFORMER  
PTC POSITIVE TRAIN CONTROL

PTD/R PAPER TOWEL DISPENSER & RECEPTACLE  
PTM PASSENGER ASSISTANCE TELEPHONE  
PTT PARKING TICKET MACHINE  
PTZ PUSH TO TALK  
PUE PAN-TILT-ZOOM  
PVC PUBLIC UTILITY EASEMENT  
PVMT POLYVINYL CHLORIDE  
PWR PAVEMENT  
POWER

OOS QUALITY OF SERVICE  
QT QUARRY TILE  
QTY QUANTITY

R RADIUS,  
RED  
R/A ROCK ANCHOR  
R/W, ROW RIGHT OF WAY  
R&D REMOVE AND DISPOSE  
R&S REMOVE AND SALVAGE  
RA REMOTE ANNUNCIATOR  
RAID REDUNDANT ARRAY OF INDEPENDENT DISKS  
RB RESILIENT BASE  
RBM RAILBOUND MANGANESE FROG  
RC REGIONAL CONSULTANT,  
REINFORCED CONCRETE  
RCA REINFORCED CONCRETE ARCH  
RCB REINFORCED CONCRETE BOX  
RCC REGIONAL CONTROL CENTER  
RCE REGISTERED CIVIL ENGINEER  
RCP REINFORCED CONCRETE PIPE  
RCPA REINFORCED CONCRETE PIPE ARCH  
RD ROAD,  
ROOF DRAIN  
RDWY ROADWAY  
RE RUNNING EDGE OF RAIL  
REBAR CONCRETE REINFORCING BAR  
RECT RECTANGULAR  
REF REFERENCE  
REFP REFERENCE POINT  
REINF REINFORCED,  
REINFORCEMENT,  
REINFORCING  
REL RELOCATE,  
RELOCATED  
REM REMOTE  
REPL REPLACEMENT  
REQD REQUIRED  
RESIL RESILIENT  
RET RETAINING  
REV REVISED,  
REVISION  
RF RADIO FREQUENCY  
RFI REQUEST FOR INFORMATION  
RGS RIGID GALVANIZED STEEL  
RH RIGHT-HAND  
R-M ROAD-MIXED  
RM RESTRICTED MANUAL,  
ROOM  
RO ROUGH OPENING  
RP RADIUS POINT  
RR RAILROAD,  
RUNNING RAIL  
RRR RESURFACING, RESTORATION, REHABILITATION (3R)  
RRRR RESURFACING, RESTORATION, REHABILITATION,  
RECONSTRUCTION (4R)  
RRX RAILROAD GRADE CROSSING  
RSP ROCK SLOPE PROTECTION  
RT RESILIENT TILE,  
RIGHT  
RTE ROUTE  
RTU REMOTE TERMINAL UNIT  
RW RETAINING WALL  
RWL RAIN WATER LEADER  
RWY RAILWAY

R

Q

P CONTINUED

S SOUTH,  
SLOPE  
STRUCTURE APPROACH EMBANKMENT  
SAE SALVAGE  
SALV STRUCTURAL ALUMINUM PLATE PIPE  
SB SOUTHBOUND  
SC SWITCH CABLE  
SCADA SUPERVISORY CONTROL AND DATA  
ACQUISITION  
SCAT SIMPLE CATENARY-AUTO TENSION  
SCB SUBSTATION CONTROL BUILDING  
SCC STATION CONTROL CENTER  
SCD SEAT COVER DISPENSER  
SCFT SIMPLE CATENARY-FIXED TENSION  
SCHD SCHEDULE  
SCN SECURITY CLASSIFICATION NUMBERS  
SCPE SEISMIC CAPACITY AND PERFORMANCE  
EVALUATION  
SCSP SLOTTED CORRUGATED STEEL PIPE  
SD STORM DRAIN  
SDB SYSTEM DUCT BANK  
SDC SEISMIC DESIGN CRITERIA  
SDOF SINGLE DEGREE OF FREEDOM  
SE SUPER ELEVATION  
SECTLEG SECTIONALIZING  
SECT SECTION  
SEP SEPARATION  
SERV SERVICE  
SF SPRING FROG  
SG SUBGRADE  
SHA SEISMIC HAZARDS ANALYSIS  
SHLD SHOULDER  
SHS STATE HIGHWAY SYSTEM  
SHT SHEET  
SI SECTION INSULATOR,  
SITE INVESTIGATION  
SIG SIGNAL  
SIM SIMILAR  
SLAN PASSENGER STATION LOCAL AREA NETWORK  
SM SELECTED MATERIAL  
SMF SOLID MANGANESE FROG,  
SINGLE MODE FIBER  
SNF SWING NOSE FROG  
SNTP SIMPLE NETWORK TIME PROTOCOL  
SP SPARE  
SPC SPECIAL  
SPEC SPECIFICATION  
SPKR SPEAKER  
SPL SAFETY PERFORMANCE LEVEL  
SPS SMALL PART STEELWORK  
SPST SINGLE POLE SINGLE THROW  
SPT STANDARD PENETRATION TEST  
SQ SQUARE  
SR SYSTEM REQUIREMENT,  
STATE ROUTE  
SRRR SAFETY ROADSIDE REST AREA  
SRSS SQUARE ROOT OF SUM OF SQUARES  
S/SPAN STEADY SPAN  
SS SLOPE STAKE,  
SUB STATION  
SSCOM SEISMIC SAFETY COMMISSION  
SSI SOIL STRUCTURE INTERACTION  
SSK SERVICE SINK  
SSPA STRUCTURAL STEEL PLATE ARCH  
SSPP STRUCTURAL STEEL PLATE PIPE  
SSPPA STRUCTURAL STEEL PLATE PIPE ARCH  
SSRP STEEL SPIRAL RIB PIPE  
SST STAINLESS STEEL  
SSW STEADY SPAN WIRE  
SSWR SANITARY SEWER  
ST STREET  
STA STATION,  
STATIONING  
STBB SINGLE THRIE BEAM BARRIER  
STD STANDARD  
STC SINGLE TRACK CANTILEVER  
STIFF STIFFENER  
STL STEEL  
STOR STORAGE  
STP SHIELDED TWISTED PAIR CABLE  
STR STRUCTURAL,  
STRUCTURE  
STS SPIRAL TANGENT SPIRAL  
STW STATIC WIRE  
SUPV SUPERVISORY

S

SURF SURFACING  
SUSP SUSPENDED  
SWK SIDEWALK  
SW SOUND WALL,  
SOFTWARE  
SWA SINGLE WIRE ANCHOR  
SWAT SINGLE WIRE AUTO TENSIONED  
SWFT SINGLE WIRE-FIXED TERMINATION  
SWGR SWITCHGEAR  
SWT SWITCH  
SWPPP STORM WATER POLLUTION PREVENTION PLAN  
SWR SEWER  
SWS SWITCHING STATION  
SYM SYMMETRICAL

T

T TREAD  
T&B TOP AND BOTTOM  
TAN TANGENT  
TASAS TRAFFIC ACCIDENT SURVEILLANCE  
ANALYSIS SYSTEM  
TBD TO BE DETERMINED  
TBM TUNNEL BORING MACHINE  
TCL TRACK CENTERLINE  
TC TRAIN CONTROL  
TCB TRAFFIC CONTROL BOX  
TCC TRAIN CONTROL AND COMMUNICATIONS  
TCCR TRAIN CONTROL AND COMMUNICATIONS ROOM  
TCCT TRACK CIRCUIT  
TCE TEMPORARY CONSTRUCTION EASEMENT  
TCP/IP TRANSMISSION CONTROL PROTOCOL/  
INTERNET PROTOCOL  
TCR TRANSMISSION COMMUNICATIONS ROOM  
TD TRENCH DRAIN,  
TIME DELAY  
TDA TIRE DERIVED AGGREGATE  
TDD TELECOMMUNICATIONS DEVICE FOR THE DEAF  
TDM TIME DIVISION MULTIPLEXING  
TEL TELEPHONE  
TEMP TEMPORARY  
TERM TERMINATION  
TES TRACTION ELECTRIFICATION SYSTEM  
TESC TEMPORARY EROSION AND SETTLEMENT CONTROL  
TETEL TRAIN EMERGENCY TELEPHONE/SPEAKERPHONE  
TFE TETRAFLOUROETHYLENE  
TG TOP OF GRADE  
THK THICK  
TIS TELEPHONE AND INTERCOM SYSTEM  
TL TENSION LENGTH  
TM TECHNICAL MEMORANDUM  
TMP TEMPERATURE  
TO TURNOUT,  
TELECOM OUTLET  
TOC TOP OF CURB  
TOG TOP OF GRATE  
TOL TOLERANCE  
TOLR TOP OF LOW RAIL  
TOF TOP OF FOUNDATION  
TOFG TOP OF FINISH GRADE  
TOP TOP OF PAVEMENT  
TOR TOP OF RAIL  
TOS TOP OF SLOPE  
TOT TOP OF TIE,  
TOTAL  
TOW TOP OF WALL  
TP TELEPHONE POLE,  
TRACTION POWER  
TPB TREATED PERMEABLE BASE  
TPD TOILET PAPER DISPENSER  
TPF TRACTION POWER FACILITY  
TPM TREATED PERMEABLE MATERIAL  
TPS TRACTION POWER SUPPLY SYSTEM  
TRANS TRANSVERSE,  
TRANSITION  
TRK TRACK  
TS TRAFFIC SIGNAL  
TSI TUBULAR STEEL  
TECHNICAL SPECIFICATIONS FOR  
INTEROPERABILITY  
TSM TRAFFIC SYSTEMS MANAGEMENT  
TSMF TRAFFIC SYSTEMS MANAGEMENT PLAN

S CONTINUED

REV	DATE	BY	CHK	APP	DESCRIPTION

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PARSONS  
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CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DIRECTIVE DRAWING

ACRONYMS AND ABBREVIATIONS 3

CONTRACT NO.
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T CONTINUED

W CONTINUED

TRACK GEOMETRY - HORIZONTAL

UNITS OF MEASUREMENT

TTC TWO TRACK CANTILEVER  
TTEL TRAIN EMERGENCY SPEAKERPHONE  
TV TELEVISION  
TVM(S) TICKET VENDING MACHINE(S)  
TW TIE WIRE  
TYP TYPICAL

WS WATER SURFACE,  
WORK STATION  
WSP WELDED STEEL PIPE  
WT WEIGHT  
WV WATER VALVE  
WW WINGWALL,  
WALKWAY  
WWF WELDED WIRE FABRIC  
WWLOL WINGWALL LAYOUT LINE  
WWM WELDED WIRE MESH

BC BEGIN HORIZONTAL CURVE  
CC COMPOUND CURVE  
CS POINT OF CHANGE FROM CIRCULAR CURVE TO SPIRAL  
K1 TANGENT DISTANCE PF SHIFT PC  
REFERENCE TO THE TS  
K2 TANGENT DISTANCE PF SHIFT PT  
REFERENCE TO THE ST  
Lc LENGTH OF CIRCULAR CURVE  
Ls1 LENGTH OF SPIRAL  
Ls2 LENGTH OF SPIRAL FROM TS TO SC  
LSc LENGTH OF SPIRAL FROM CS TO ST  
LVC LENGTH OF COMPOUND SPIRAL FROM CS TO SC  
p1 OFFSET FROM INITIAL TANGENT TO PC OF THE SHIFTED  
CIRCLE OF SPIRALIZED CURVE  
p2 OFFSET FROM INITIAL TANGENT TO PT OF THE SHIFTED  
CIRCLE OF SPIRALIZED CURVE  
PC POINT OF CURVATURE  
PCC POINT OF COMPOUND CURVE  
PF POINT OF FROG  
PI POINT OF INTERSECTION  
PITO POINT OF INTERSECTION TURNOUT  
POC POINT ON HORIZONTAL CURVE  
POE POINT OF ENDING  
POS POINT ON SPIRAL,  
POVC POINT ON VERTICAL CURVE  
POVT POINT ON VERTICAL TANGENT  
PRC POINT OF REVERSE CURVE  
PRVC POINT OF REVERSE VERTICAL CURVE  
PS POINT OF SWITCH  
PT POINT OF TANGENT

Ac ACRES  
AMP AMPERES  
BTU BRITISH THERMAL UNIT  
CAL CALIPER  
CF CUBIC FEET  
CP CANDLE POWER  
CY CUBIC YARD  
dB DECIBEL  
DEG DEGREE  
DIA DIAMETER  
Eu UNBALANCED SUPERELEVATION  
F FARENHEIT  
FT FOOT,  
FEET  
g ACCELERATION DUE TO GRAVITY  
GA GAUGE  
GAL GALLON  
GB GIGABYTE  
GBPS GIGABITS PER SECOND  
GHz GIGAHERTZ  
HR HOUR  
HT HEIGHT  
Hz HERTZ  
ID INSIDE DIAMETER  
IF INSIDE FACE  
IN INCHES  
IR INSIDE RADIUS

U/S UNDERSIDE  
UB UTILITY BOX  
UC UNDERCROSSING  
UD UNDERDRAIN  
UG UNDERGROUND,  
UNDER GRADE  
UGB UNDERGRADE BRIDGE  
UI USER INTERFACE  
UNF UNFINISHED  
UNINS UNINSULATED  
UON UNLESS OTHERWISE NOTED  
UP UNDERPASS  
UPS UNINTERRUPTIBLE POWER SUPPLY  
UR URINAL  
UrEDAS URGENT EARTHQUAKE DETECTION AND  
ALARM SYSTEM  
USCS UNITED SOIL CLASSIFICATION SYSTEM  
UTIL UTILITY  
UTP UNSHIELDED TWISTED PAIR  
UWP UPPER WORKING POINT

X/CAT CROSS CANTENARY  
X/SPAN CROSS SPAN  
XD TRANSDUCER  
XFMR TRANSFORMER  
XO CROSSOVER  
XO ST CROSSOVER SPRING TENSIONER  
XSEC CROSS SECTION  
XING CROSSING  
XMITTER TRANSMITTER

SC POINT OF CHANGE FROM SPIRAL TO  
CIRCULAR CURVE  
SPO POINT ON ORIGIN OF COMPOUND SPIRAL  
SS POINT OF CHANGE BETWEEN SPIRALS  
SSC SPIRAL TO SPIRAL POINT OF CURVATURE  
ST POINT OF CHANGE FROM SPIRAL TO TANGENT  
TC POINT OF CHANGE FROM TANGENT TO CURVE  
TS POINT OF CHANGE FROM TANGENT TO SPIRAL  
Ts1 TANGENT DISTANCE FROM TS TO PI  
Ts2 TANGENT DISTANCE FROM ST TO PI  
Xs1 TANGENT OFFSET AT THE SC  
Xs2 TANGENT OFFSET AT THE CS  
Ys1 TANGENT DISTANCE AT THE SC  
Ys2 TANGENT DISTANCE AT THE CS  
Δ TOTAL CENTRAL ANGLE OF THE SPIRALIZED CURVE  
Δc CENTRAL ANGLE OF CIRCULAR CURVE (Lc) FROM  
SC TO CS  
Δc1 CENTRAL ANGLE OF FIRST CIRCULAR CURVE OF  
COMPOUND CURVATURE  
Δc2 CENTRAL ANGLE OF SECOND CIRCULAR CURVE OF  
COMPOUND CURVATURE  
θs1 CENTRAL ANGLE OF SPIRAL LENGTH Ls1 OR SPIRAL  
ANGLE OF FIRST SPIRAL IN SPIRALIZED CURVE  
θs2 CENTRAL ANGLE OF SPIRAL LENGTH Ls2 OR SPIRAL  
ANGLE OF SECOND SPIRAL IN SPIRALIZED CURVE  
θsc CENTRAL ANGLE OF COMPOUND SPIRAL OR COMPOUND  
SPIRAL ANGLE FROM CS TO SC

K KIPS (1000 POUNDS)  
KCMIL THOUSAND CIRCULAR MILS  
KHz KILOHERTZ  
KSF KIPS PER SOAURE FOOT  
KSI KIPS PER SQUARE INCH  
kV KILOVOLTS  
KVA KILOVOLT-AMPERE  
KVAR KILOVOLT-AMPERE REACTIVE  
kW KILOWATT  
KWH/D KILOWATT HOUR / DEMAND  
L LENGTH  
LB POUNDS  
LB/FT POUNDS PER FOOT  
LF LINEAR FEET  
m METER  
MBPS MEGA-BITS PER SECOND  
MCM THOUSAND CIRCULAR MILS  
MHz MEGAHERTZ  
mm MILLIMETER  
MPH MILES PER HOUR  
MVA MEGAVOLT-AMPERE  
MW MEGA WATT  
OD OUTSIDE DIAMETER  
PSF POUNDS PER SQUARE FOOT  
PSI POUNDS PER SQUARE INCH  
PSIG POUNDS PER SQUARE INCH GAUGE

V DESIGN SPEED,  
VALVE  
VAC VOLTS ALTERNATING CURRENT  
VAR VARIABLE,  
VARIES,  
VCAT VOLT-AMPERE REACTIVE  
VCP VIRTUAL CONCATENATION  
VCT VITRIFIED CLAY PIPE  
VCT VINYL COMPOSITION TILE  
VDC VOLT DC  
VE VALUE ENGINEERING  
VERT VERTICAL  
VEST VESTIBULE  
VIA VIADUCT  
VLAN VIRTUAL LOCAL AREA NETWORK  
VMS VARIABLE MESSAGE SIGN,  
VARIABLE MESSAGE SYSTEM,  
VOL VOLTIMETER  
VOLUME  
VOIP VOICE OVER INTERNET PROTOCOL  
VPN VIRTUAL PRIVATE NETWORK  
VRCS VOICE RADIO COMMUNICATIONS SYSTEM  
VS VOLTAGE SWITCH  
VT VOLTAGE TRANSFORER/TRANSDUCER

W

W WEST,  
WIDTH  
W/ WITH  
W/O WITHOUT  
WA WORK AREA  
WB WESTBOUND  
WC WATER CLOSET  
WCS WIRELESS COMMUNICATIONS SYSTEM  
WD WOOD  
WLAN WIRELESS LOCAL AREA NETWORK  
WM WIRE MESH  
WP WORK POINT,  
WOOD POLE  
WPF WATERPROOF  
WPC WAYSIDE POWER CUBICLES  
WR WIRE RUN  
WRT WITH RESPECT TO

TRACK GEOMETRY - VERTICAL

BVC BEGIN VERTICAL CURVE  
Ea ACTUAL SUPERELEVATION  
EVC END VERTICAL CURVE  
PCVC POINT OF COMPOUND VERTICAL CURVE  
POVC POINT OF VERTICAL INTERSECTION  
POVT POINT ON VERTICAL CURVE  
PVI POINT ON VERTICAL TANGENT  
VC VERTICAL CURVE  
VPI VERTICAL POINT OF INTERSECTION

SEC SECOND  
SF SQUARE FEET  
SY SQUARE YARD  
TF TRACK FEET  
VA VOLTS  
VAC VOLT-AMPERE  
Y YARDS  
YR(S) YEAR(S)

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY R. MINCIO
DRAWN BY V. HUANTE
CHECKED BY S. MILITELLO
IN CHARGE J. CHIRCO
DATE 01/24/2014

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DIRECTIVE DRAWING

ACRONYMS AND ABBREVIATIONS 4

CONTRACT NO.
DRAWING NO. DD-GE-103
SCALE NO SCALE
SHEET NO.

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AGENCIES/ORGANIZATIONS/REFERENCE						AGENCIES/ORGANIZATIONS/REFERENCE CONTINUED						SEGMENT/COUNTY CODES AND SUBDIVISIONS					
AAR	ASSOCIATION OF AMERICAN RAILROADS	PG&E	PACIFIC GAS & ELECTRIC COMPANY	A-J	ALTAMONT PASS	AASHTO	AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS	PUC	PUBLIC UTILITIES COMMISSION (STATE)	B-P	BAKERSFIELD TO PALMDALE						
ACI	AMERICAN CONCRETE INSTITUTE	RSIA	RAIL SAFETY IMPROVEMENT ACT (2008)	F-B	FRESNO TO BAKERSFIELD	AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	RWQCB	REGIONAL WATER QUALITY CONTROL BOARD (STATE)	F-J	SAN FRANCISCO TO SAN JOSE						
AMTRAK	NATIONAL RAILROAD PASSENGER CORPORATION	SDG&E	SAN DIEGO GAS & ELECTRIC COMPANY	J-M	SAN JOSE TO MERCED	ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE		SAN DIEGO NORTHEN RAILWAY	L-D	LOS ANGELES TO SAN DIEGO						
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	SDNR	SAN DIEGO NORTHEN RAILWAY	L-O	LOS ANGELES TO ANAHEIM	ANSS	ADVANCED NATIONAL SEISMIC SYSTEM	SAVE	SOCIETY OF AMERICAN VALUE ENGINEERS	M-F	MERCED TO FRESNO						
APWA	AMERICAN PUBLIC WORKS ASSOCIATION	SHOPP	STATE HIGHWAY OPERATION AND PROTECTION PROGRAM (FORMERLY HSOPP)	P-L	PALMDALE TO LOS ANGELES	AREA	AMERICAN RAILWAY ENGINEERING ASSOCIATION		STATE HIGHWAY OPERATION AND PROTECTION PROGRAM (FORMERLY HSOPP)	S-M	SACRAMENTO TO MERCED						
AREMA	AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION	SHPO	STATE HISTORIC PRESERVATION OFFICER (STATE)	B	BAY SUBDIVISION												
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS	SJRRRA	SAN JOAQUIN REGIONAL RAIL AUTHORITY	C	CAPITAL SUBDIVISION	ASTM	ASTM INTERNATIONAL,	SMUD	SACRAMENTO MUNICIPAL UTILITY DISTRICT	D	DESERT SUBDIVISION						
	AMERICAN SOCIETY OF TESTING & MATERIALS	SPTC	SOUTHERN PACIFIC TRANSPORTATION COMPANY	J	SAN JACINTO SUBDIVISION			SSORC	SAFETY AND SECURITY OVERSIGHT AND REVIEW COMMITTEE	P	PACHECO SUBDIVISION						
ATC	APPLIED TECHNOLOGY COUNCIL			S	SIERRA SUBDIVISION	ATC	AMERICAN WELDING SOCIETY		SILICON VALLEY BERRYESSA EXTENSION	T	TONGVA SUBDIVISION						
AWS	AMERICAN WELDING SOCIETY	SVBX	SILICON VALLEY BERRYESSA EXTENSION	ALA	ALAMEDA	BART	BAY AREA RAPID TRANSIT DISTRICT	SVRT	SILICON VALLEY RAPID TRANSIT	ALP	ALPINE						
BDA	BRIDGE DESIGN AIDS (CALTRANS)	UPRR	UNION PACIFIC RAILROAD	AMA	AMADOR	BDD	BRIDGE DESIGN DETAILS (CALTRANS)	US	UNITED STATES	BUT	BUTTE						
BDP	BRIDGE DESIGN PRACTICE (CALTRANS)	USCE	UNITED STATES (ARMY) CORPS OF ENGINEERS	CAL	CALAVERAS	BDS	BRIDGE DESIGN SPECIFICATIONS (CALTRANS)	USCG	UNITED STATES COAST GUARD	CAL	CALAVERAS						
BNSF	BURLINGTON NORTHERN SANTA FE RAILWAY	USCS	UNITED SOIL CLASSIFICATION SYSTEM	CC	CONTRA COSTA	BNSF	BURLINGTON NORTHERN SANTA FE RAILWAY	VTA	VALLEY TRANSPORTATION AUTHORITY (OF SANTA CLARA COUNTY)	COL	COLUSA						
CALNET	CALIFORNIA INTEGRATED TELECOMMUNICATIONS NETWORK			DN	DEL NORTE	CALNET	CALIFORNIA INTEGRATED TELECOMMUNICATIONS NETWORK			ED	EL DORADO						
CALTRANS	CALIFORNIA DEPARTMENT OF TRANSPORTATION			FRE	FRESNO	CBC	CALIFORNIA BUILDING CODE			GLE	GLENN						
CBC	CALIFORNIA BUILDING CODE			HUM	HUMBOLDT	CBDM	CALIFORNIA DEPARTMENT OF TRANSPORTATION - BRIDGE DESIGN MANUAL			IMP	IMPERIAL						
CCR	CALIFORNIA CODE OF REGULATIONS			INY	INYO					KER	KERN						
CDC	CALIFORNIA HIGH-SPEED TRAIN DESIGN CRITERIA			KIN	KINGS	CCR	CALIFORNIA CODE OF REGULATIONS			LAK	LOS ANGELES						
CEC	CALIFORNIA ELECTRIC CODE			LA	LAKE	CDC	CALIFORNIA HIGH-SPEED TRAIN DESIGN CRITERIA			LAS	LASSEN						
CEQA	CALIFORNIA ENVIRONMENTAL QUALITY ACT			LAK	LAKE	CEC	CALIFORNIA ELECTRIC CODE			MAD	MADERA						
CFR	CODE OF FEDERAL REGULATIONS			MEN	MENDOCINO	CEQA	CALIFORNIA ENVIRONMENTAL QUALITY ACT			MER	MERCED						
CHD	COUNTY HEALTH DEPARTMENT			MNO	MONO	CFR	CODE OF FEDERAL REGULATIONS			MOD	MODOC						
CHP	CALIFORNIA DEPARTMENT OF HIGHWAY PATROL (STATE)			MON	MONTEREY	CHD	COUNTY HEALTH DEPARTMENT			MPA	MARIPOSA						
CHST	CALIFORNIA HIGH-SPEED TRAIN			MRN	MARIN	CHP	CALIFORNIA DEPARTMENT OF HIGHWAY PATROL (STATE)			MRN	MARIN						
CHSTP	CALIFORNIA HIGH-SPEED TRAIN PROJECT			NAP	NAPA	CHST	CALIFORNIA HIGH-SPEED TRAIN			NEV	NEVADA						
CIWMB	CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD (STATE)			ORA	ORANGE	CHSTP	CALIFORNIA HIGH-SPEED TRAIN PROJECT			PLA	PLACER						
CPH	CALIFORNIA PERMIT HANDBOOK			PLU	PLUMAS	CIWMB	CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD (STATE)			RIV	RIVERSIDE						
CPUC	CALIFORNIA PUBLIC UTILITIES COMMISSION			SAC	SACRAMENTO					SBD	SANTA BARBARA						
CRR	COMMUTER RAIL PROGRAM (STATE)			SB	SANTA BARBARA	CPH	CALIFORNIA PERMIT HANDBOOK			SBT	SAN BERNADINO						
DOD	DEPARTMENT OF DEFENSE (FEDERAL)			SCL	SANTA CLARA	CPUC	CALIFORNIA PUBLIC UTILITIES COMMISSION			SCL	SANTA CLARA						
DOT	DEPARTMENT OF TRANSPORTATION (FEDERAL)			SCR	SANTA CRUZ	CRR	COMMUTER RAIL PROGRAM (STATE)			SD	SAN DIEGO						
DTX	DOWNTOWN EXTENSION (CALTRAIN)			SF	SAN FRANCISCO	DOD	DEPARTMENT OF DEFENSE (FEDERAL)			SHA	SHASTA						
EIRENE	EUROPEAN INTEGRATED RADIO ENHANCED NETWORK			SIE	SIERRA	DOT	DEPARTMENT OF TRANSPORTATION (FEDERAL)			SIS	SISKIYOU						
ERTMS	EUROPEAN RAIL TRAFFIC MANAGEMENT SYSTEM			SJ	SAN JOAQUIN	DTX	DOWNTOWN EXTENSION (CALTRAIN)			SLO	SAN LUIS OBISPO						
FAA	FEDERAL AVIATION ADMINISTRATION			SM	SAN MATEO	EIRENE	EUROPEAN INTEGRATED RADIO ENHANCED NETWORK			SOL	SOLANO						
FCC	FEDERAL COMMUNICATIONS COMMISSION			SON	SONOMA	ERTMS	EUROPEAN RAIL TRAFFIC MANAGEMENT SYSTEM			STA	STANISLAUS						
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY			SUT	SUTTER	FAA	FEDERAL AVIATION ADMINISTRATION			TEH	TEHAMA						
FHWA	FEDERAL HIGHWAY ADMINISTRATION			TUL	TULARE	FCC	FEDERAL COMMUNICATIONS COMMISSION			TR	TRINITY						
FMFCD	FRESNO METROPOLITAN FLOOD CONTROL DISTRICT			TUO	TUOLUMNE	FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY			TUL	TULARE						
FRA	FEDERAL RAILROAD ADMINISTRATION			VEN	VENTURA	FHWA	FEDERAL HIGHWAY ADMINISTRATION			YOL	YOLO						
FSTIP	FEDERAL STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM			YUB	YUBA	FMFCD	FRESNO METROPOLITAN FLOOD CONTROL DISTRICT										
FTA	FEDERAL TRANSIT ADMINISTRATION					FRA	FEDERAL RAILROAD ADMINISTRATION										
GBR	GEOTECHNICAL BASELINE REPORT					FSTIP	FEDERAL STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM										
GBR-B	GEOTECHNICAL BASELINE REPORT FOR BIDDING																
GBR-C	GEOTECHNICAL BASELINE REPORT FOR CONSTRUCTION																
GDR	GEOTECHNICAL DATA REPORT																
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS																
ISO	INTERNATIONAL ORGANIZATION FOR STANDARDIZATION																
LADWP	LOS ANGELES DEPARTMENT OF WATER AND POWER																
LAUS	LOS ANGELES UNION STATION																
LTC	LOCAL TRANSPORTATION COMMISSION																
MUTCD	MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES																
NAAOS	NATIONAL AMBIENT AIR QUALITY STANDARDS																
NAC	NOISE ABATEMENT CRITERIA																
NBSSR	NOISE BARRIER SCOPE SUMMARY REPORT																
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION																
NENA	NATIONAL EMERGENCY NUMBER ASSOCIATION																
NESC	NATIONAL ELECTRICAL SAFETY CODE																
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION																
NIST	NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY																
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION																
PEER	PACIFIC EARTHQUAKE ENGINEER RESEARCH																

						DESIGNED BY R. MINCIO											
						DRAWN BY V. HUANTE											
						CHECKED BY S. MILITELLO											
						IN CHARGE J. CHIRCO											
						DATE 01/24/2014											
REV	DATE	BY	CHK	APP	DESCRIPTION												

CALIFORNIA HIGH-SPEED TRAIN PROJECT DIRECTIVE DRAWING						CONTRACT NO.
ACRONYMS AND ABBREVIATIONS 5						DRAWING NO. DD-GE-104
						SCALE NO SCALE
						SHEET NO.



1. THIS DRAWING DEPICTS THE REQUIREMENTS OF PLACING SURVEY BENCHMARKS WITHIN THE AUTHORITY'S ROW DUE TO THE POSSIBLE PRESENCE OF GROUND SUBSIDENCE. BENCHMARKS TO BE PLACED ON EACH SIDE OF THE EMBANKMENT AT APPROXIMATELY 2500' INTERVALS WITH 1250' OFFSET ON EACH SIDE OF THE EMBANKMENT. ALL BENCHMARKS SHALL BE PLACED IN A CLEAR LINE OF SIGHT OF THE FUTURE TOP OF RAIL.
2. FOR ADDITIONAL INFORMATION ON BENCHMARK INSTALLATION REFER TO SURVEY MARKERS AND DOCUMENTATION, US ARMY CORPS OF ENGINEERS, EM 1110-1-1002, TYPE B MONUMENT-DEEP ROD.
3. PROVIDE A GPS BASED SURVEY OF THE MONITORING SURVEY BENCHMARKS.
4. ESTABLISH NON-MOVING BENCHMARK CONTROL POINT, SOME OF WHICH WILL BE LOCATED OUTSIDE OF THE CENTRAL VALLEY SUBSIDENCE AREA AND 20-30 MILES TO THE EAST OF THE SIERRA NEVADA FOOTHILLS
5. SUBMIT AS-BUILTS OF THE MONUMENTS GIVING EXACT COORDINATE LOCATIONS, ELEVATIONS, NUMBERING, INSTALLATION DATES, LENGTH OF RODS INSTALLED, AND OTHER PERTAINENT DATA.
6. INSTALL SURVEY BENCHMARKS AND OBTAIN BASELINE READINGS AGREED BY THE AUTHORITY AT LEAST 90 CALENDAR DAYS BEFORE THE START OF ANY CONSTRUCTION.
7. PROVIDE A WEB-BASED USER INTERFACE THAT CAN BE RUN FROM ANY WEB BROWSER TO ALLOW A COMPLETE REVIEW OF THE SURVEY DATA IN GRAPHICAL FORMAT. TABULATED DATA SHALL BE PRESENTED AS SHOWN ON DETAIL 3 ON DIRECTIVE DRAWINGS TITLED "SURVEY BENCHMARK DETAILS."
8. DO NOT DISCLOSE ANY SURVEY DATA TO ANY THIRD PARTIES OTHER THAN THE AUTHORITY OR OTHER APPROVED THIRD PARTIES AND DO NOT PUBLISH DATA FOR OTHER THAN PROJECT USE WITHOUT PRIOR WRITTEN CONSENT OF THE AUTHORITY. SEE DIRECTIVE DRAWING TITLED "SURVEY BENCHMARK" FOR CONTROL POINT TABLE REQUIREMENTS.
9. WITNESS POST SIGN SHALL BE MADE OF ALUMINUM WITH A THICKNESS OF 1/16 INCH, WITH A DURABLE DECAL. THE SIGN SHALL BE FASTENED TO THE POST EITHER USING GALVANIZED OR STAINLESS STEEL BOLTS, NUTS AND WASHER, WITH SAID BOLT BEING 3/8 INCH DIAMETER AND LONG ENOUGH TO PROTRUDE 1/2 INCH OR LONGER BEYOND THE REAR OF THE POST.

DESIGNED BY	B. VALENTI
DRAWN BY	V. LAVERDE
CHECKED BY	T. LEE
IN CHARGE	J. ELLIOT
DATE	08/24/2015

CONTRACT NO.

DRAWING NO.  
DD-SV-101

SCALE  
NO SCALE

SHEET NO.

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SURVEY DATA

POINT NAME	LATITUDE	LONGITUDE	NORTHING	EASTING	GRID FACTOR	COMBINED FACTOR	CONERGERENCE	POINT ELEVATION	DESCRIPTION
------------	----------	-----------	----------	---------	-------------	-----------------	--------------	-----------------	-------------

COMPARSION DATA

SURVEY DATA FROM YYYY/MM/DD*					DELTA	
POINT NAME	POINT ELEVATION	NORTHING	EASTING	ELEV	X SHIFT	Y SHIFT

\*SURVEY DATA SHALL BE COMPILED EVERY SIX MONTHS

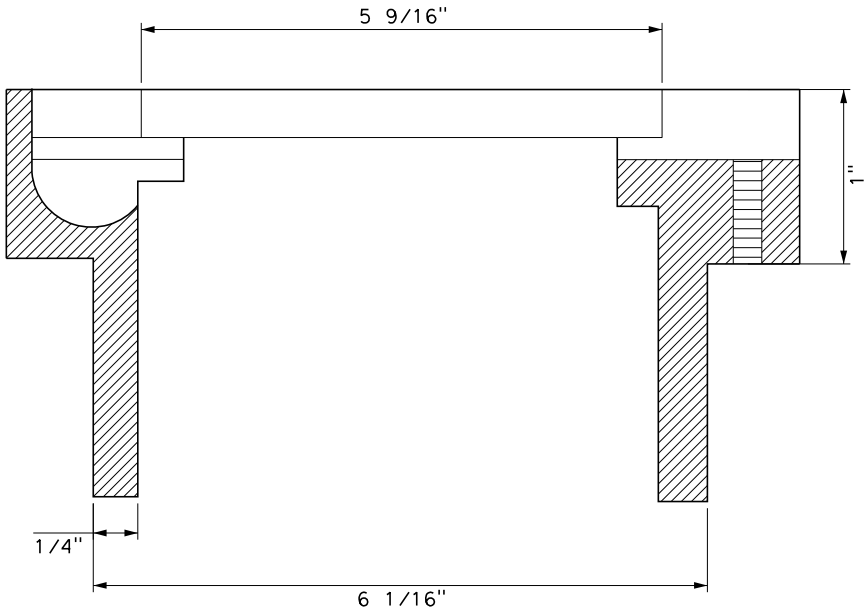
XXXX INDICATES POINT DESIGNATION (NAME)  
YYYY LAND SURVEYOR NUMBER  
20XX INDICATES YEAR  
CP-X INDICATES CONSTRUCTION PACKAGE

NOTES:

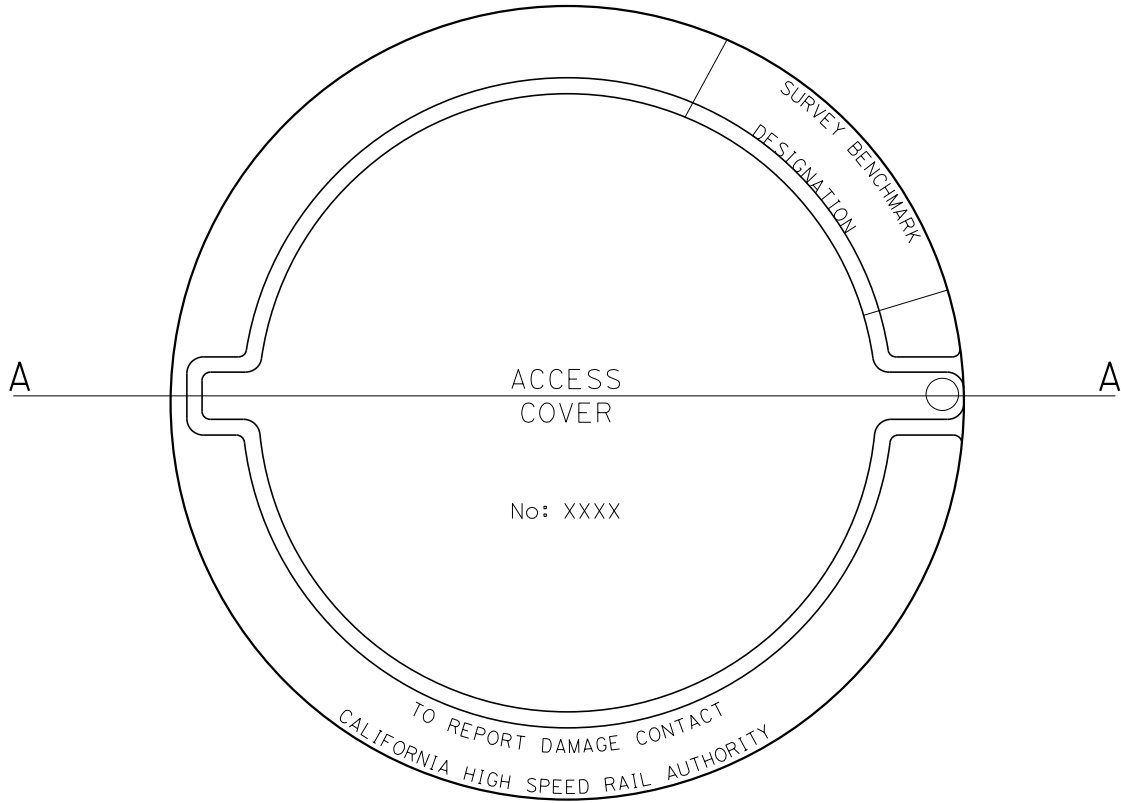
1. THIS DRAWING DEPICTS THE REQUIREMENTS OF PLACING SURVEY BENCHMARKS WITHIN THE AUTHORITIES ROW DUE TO THE POSSIBLE PRESENCE OF GROUND SUBSIDENCE.
2. FOR ADDITIONAL INFORMATION ON BENCHMARK INSTALLATION REFER TO SURVEY MARKERS AND DOCUMENTATION, US ARMY CORPS OF ENGINEERS, EM 1110-1-1002, TYPE B MONUMENT-DEEP ROD.

DETAIL 3

SAMPLE BENCHMARK SURVEY DATA TABLE



SECTION A-A

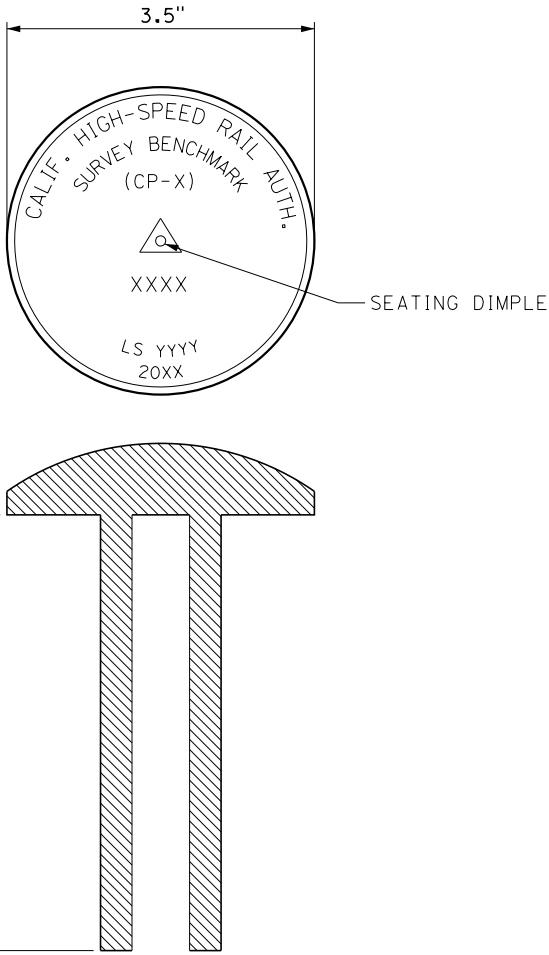


DETAIL 2

ACCESS COVER

DETAIL 1

SURVEY DISK ON ROD



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY B. VALENTI
DRAWN BY V. LAVERDE
CHECKED BY T. LEE
IN CHARGE J. ELLIOT
DATE 08/28/2015

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
SURVEY DIRECTIVE

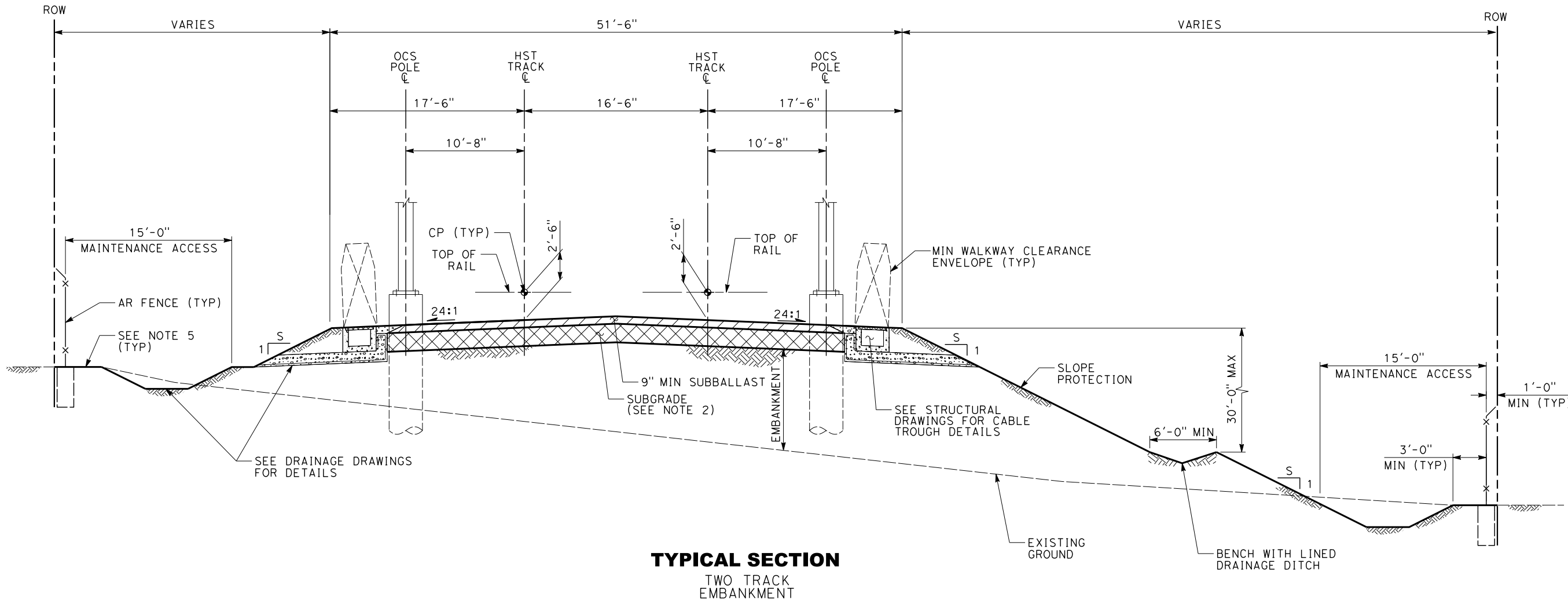
SURVEY BENCHMARK DETAILS

CONTRACT NO.
DRAWING NO. DD-SV-102
SCALE NO SCALE
SHEET NO.

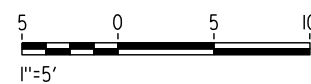


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- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
  3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
  4. FOR EMBANKMENT SLOPE GRADING, S=2 (MIN).
  5. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.



**TYPICAL SECTION**  
TWO TRACK  
EMBANKMENT



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY V. HUANTE
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

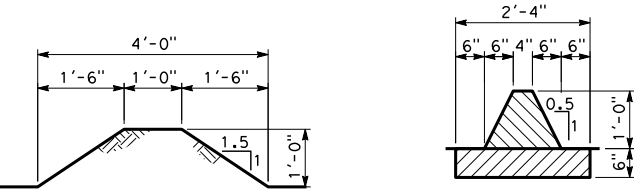
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

TYPICAL CROSS SECTION  
TWO TRACK  
EMBANKMENT

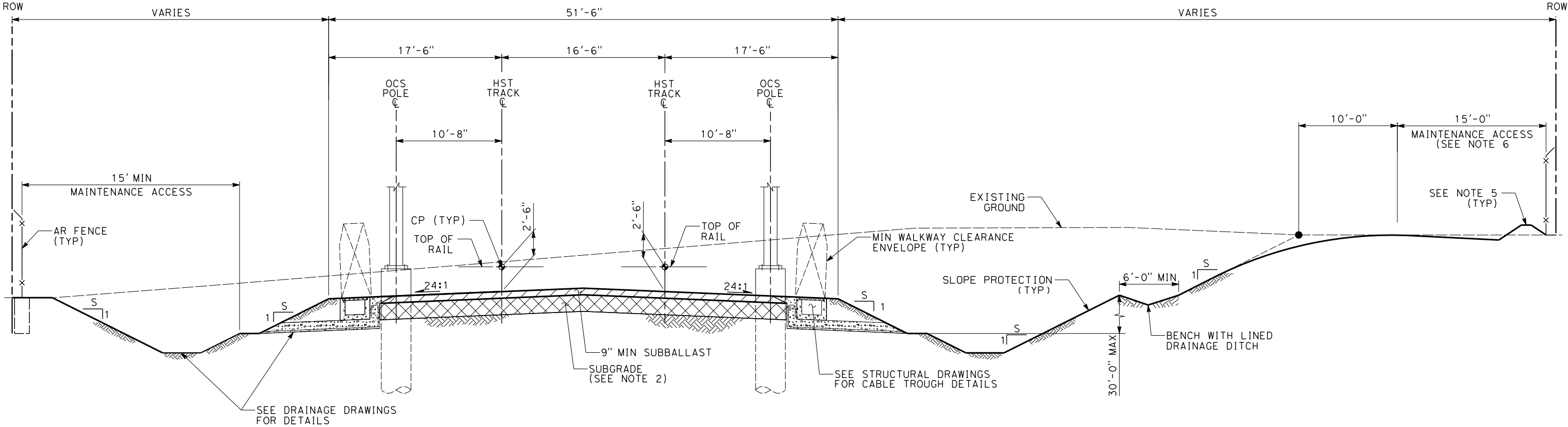
CONTRACT NO.
DRAWING NO. DD-CV-100
SCALE AS SHOWN
SHEET NO.

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- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
  3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
  4. FOR EMBANKMENT SLOPE GRADING, S=2 (MIN).
  5. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.
  6. A 20-FOOT MAINTENANCE ACCESS IS REQUIRED FOR CUT SLOPES HIGHER THAN 30 FEET.



**PROTECTIVE BARRIER DETAILS**  
(SEE NOTE 5)



**TYPICAL SECTION**  
TWO TRACK  
OPEN CUT

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

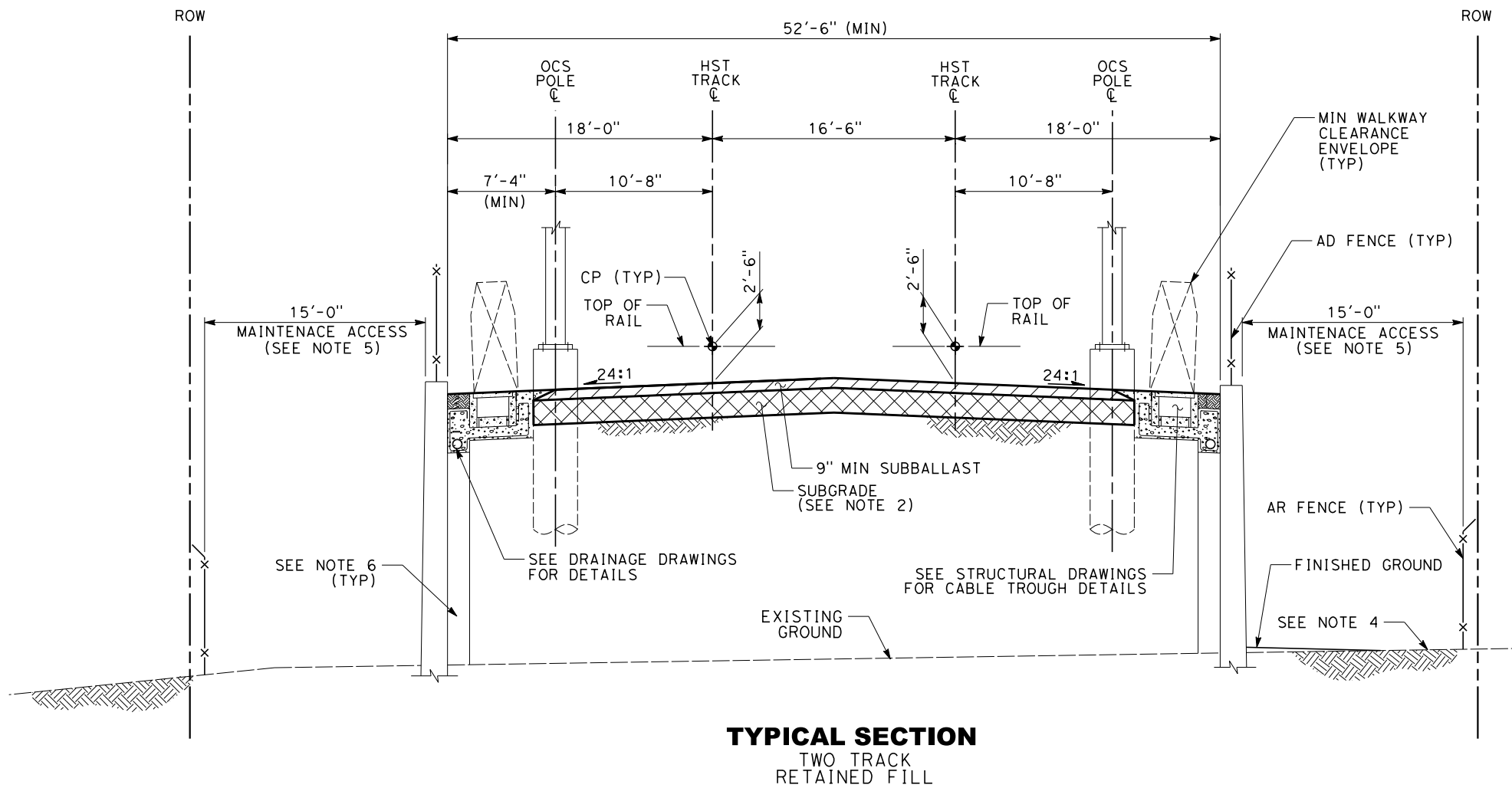
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

TYPICAL CROSS SECTION  
TWO TRACK  
OPEN CUT

CONTRACT NO.
DRAWING NO. DD-CV-101
SCALE AS SHOWN
SHEET NO.

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

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- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
  3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
  4. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.
  5. 10' MIN MAINTENANCE ACCESS REQUIRED WHEN THERE IS NO FENCE OR CONTINUOUS OBSTRUCTION.
  6. PROVIDE APPROPRIATE DRAINAGE SYSTEM FOR THE TYPE OF RETAINING WALL.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY S. MILITELLO
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 08/29/2014

**PARSONS  
BRINCKERHOFF**



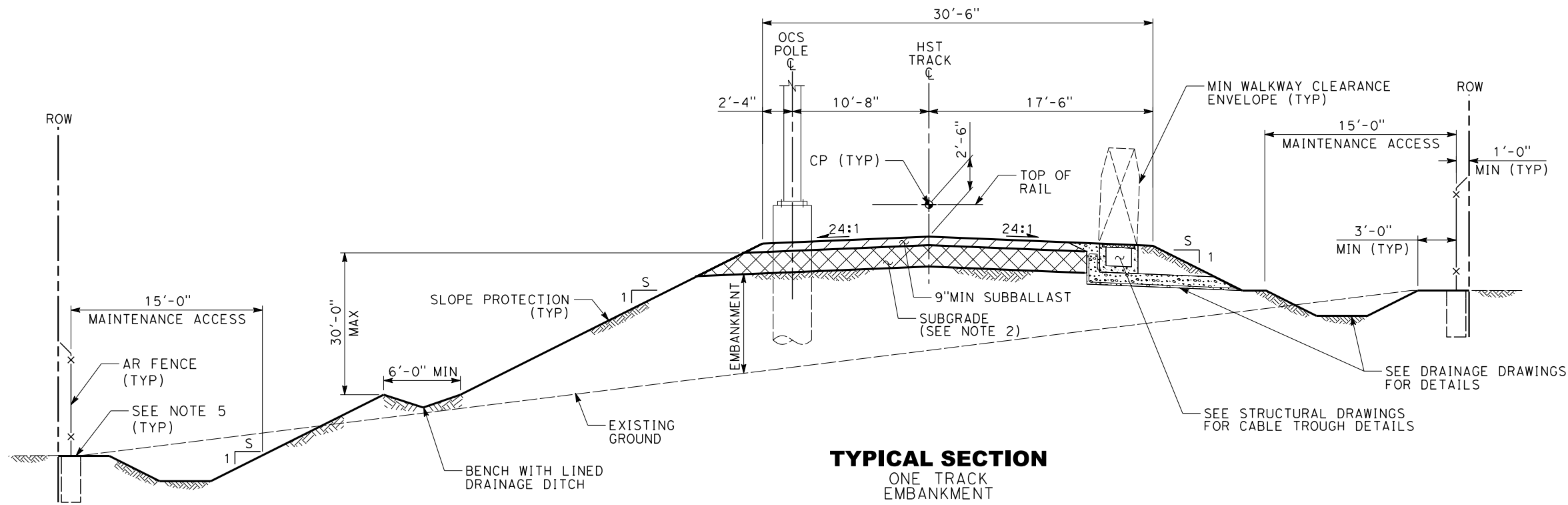
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

TYPICAL CROSS SECTION  
TWO TRACK  
RETAINED FILL

CONTRACT NO.
DRAWING NO. DD-CV-102
SCALE AS SHOWN
SHEET NO.

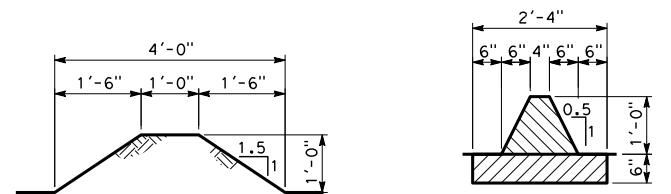
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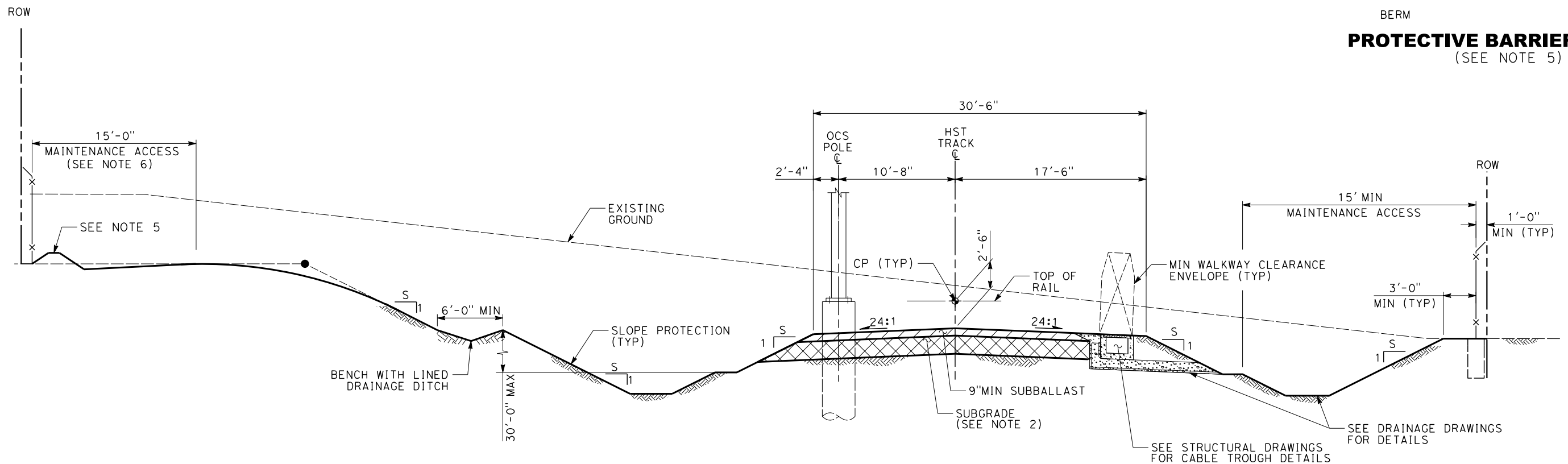
**TYPICAL SECTION**  
ONE TRACK  
EMBANKMENT

**NOTES:**

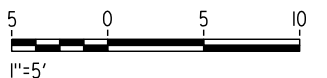
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
4. FOR EMBANKMENT SLOPE GRADING, S=2 (MIN).
5. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.
6. A 20-FOOT MAINTENANCE ACCESS IS REQUIRED FOR CUT SLOPES HIGHER THAN 30 FEET.



**PROTECTIVE BARRIER DETAILS**  
(SEE NOTE 5)



**TYPICAL SECTION**  
ONE TRACK  
OPEN CUT



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

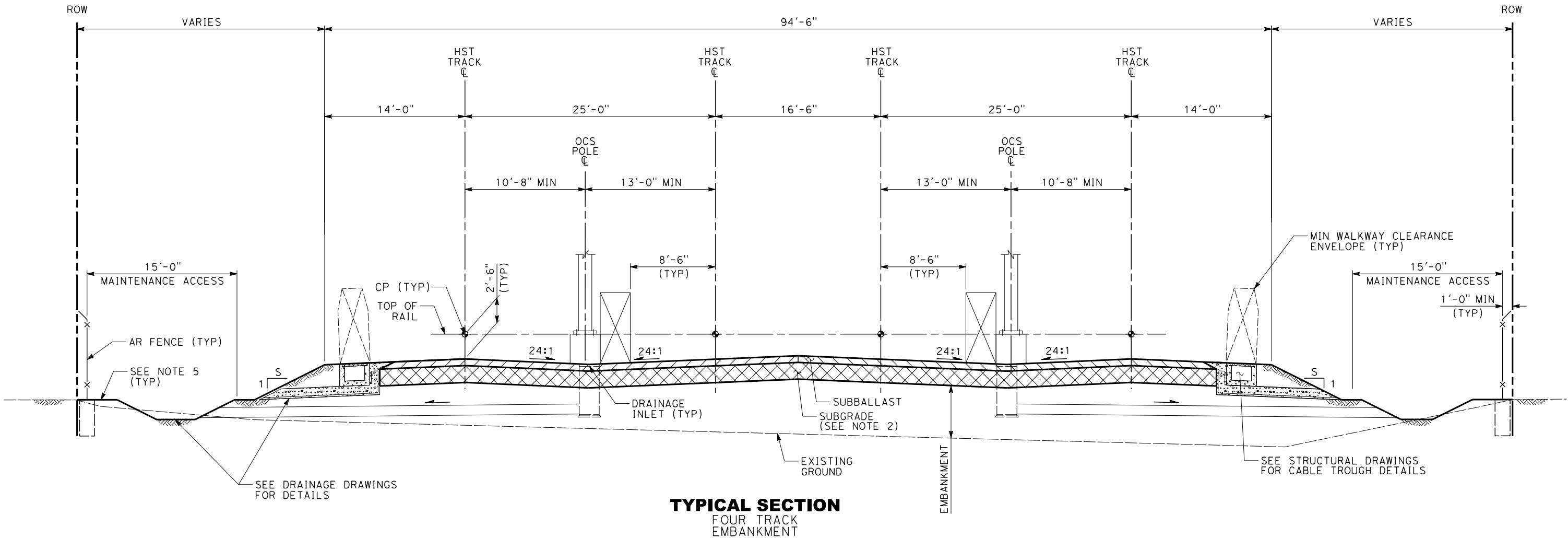
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

TYPICAL CROSS SECTION  
ONE TRACK  
EMBANKMENT AND OPEN CUT

CONTRACT NO.
DRAWING NO. DD-CV-103
SCALE AS SHOWN
SHEET NO.

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- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
  3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
  4. FOR EMBANKMENT SLOPE GRADING, S=2 (MIN).
  5. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.



**TYPICAL SECTION**  
FOUR TRACK  
EMBANKMENT



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

TYPICAL CROSS SECTION  
FOUR TRACK  
EMBANKMENT

CONTRACT NO.
DRAWING NO. DD-CV-104
SCALE AS SHOWN
SHEET NO.

1. STRUCTURE TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF STRUCTURE WITH NON-BALLASTED TRACK. FOR BALLASTED TRACK THE CONTROL POINT (CP) SHALL BE LOCATED ABOVE STRUCTURE DECK AT A DISTANCE 2'-9" PLUS ALLOWANCE FOR WATER PROOFING MEMBRANE AND PROTECTION LAYER (IF REQUIRED).
4. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.



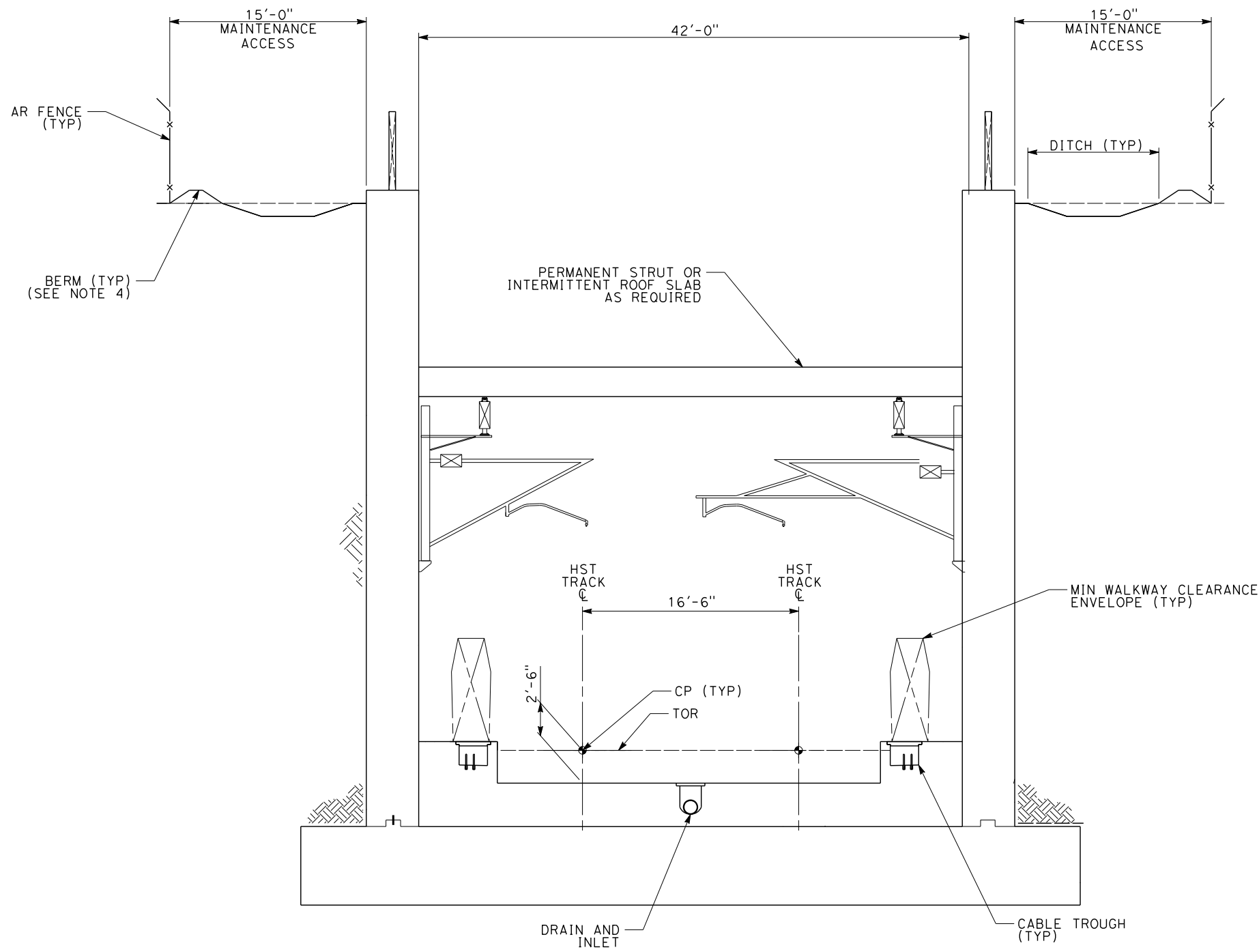
DESIGNED BY D. MANITI
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

TYPICAL CROSS SECTION  
TWO TRACK  
AERIAL TRACKWAY

CONTRACT NO.
DRAWING NO. DD-CV-105
SCALE AS SHOWN
SHEET NO.

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

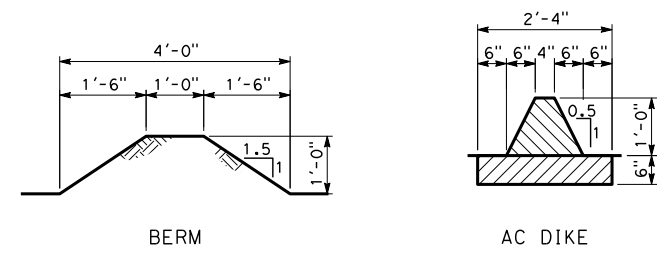
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TYPICAL SECTION  
TRENCH

NOTES:

1. STRUCTURE, TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SUBGRADE THICKNESS SHALL BE DETERMINED BASED ON THE EXISTING GROUND CONDITION.
3. THE CONTROL POINT (CP) SHALL BE 2'-6" ABOVE THE TOP OF SUBBALLAST.
4. PROTECTIVE BARRIER, SUCH AS A BERM OR A DIKE, SHALL BE INSTALLED AT THE RIGHT-OF-WAY BOUNDARY TO INTERCEPT STORM WATER RUN OFF, WHERE THERE IS A POTENTIAL FOR STORM WATER RUN OFF TO ENTER CHST RIGHT-OF-WAY FROM ADJACENT PROPERTY.



PROTECTIVE BARRIER DETAILS  
(SEE NOTE 5)

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY D. MANITI
DRAWN BY R. MINCIO
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

PARSONS  
BRINCKERHOFF

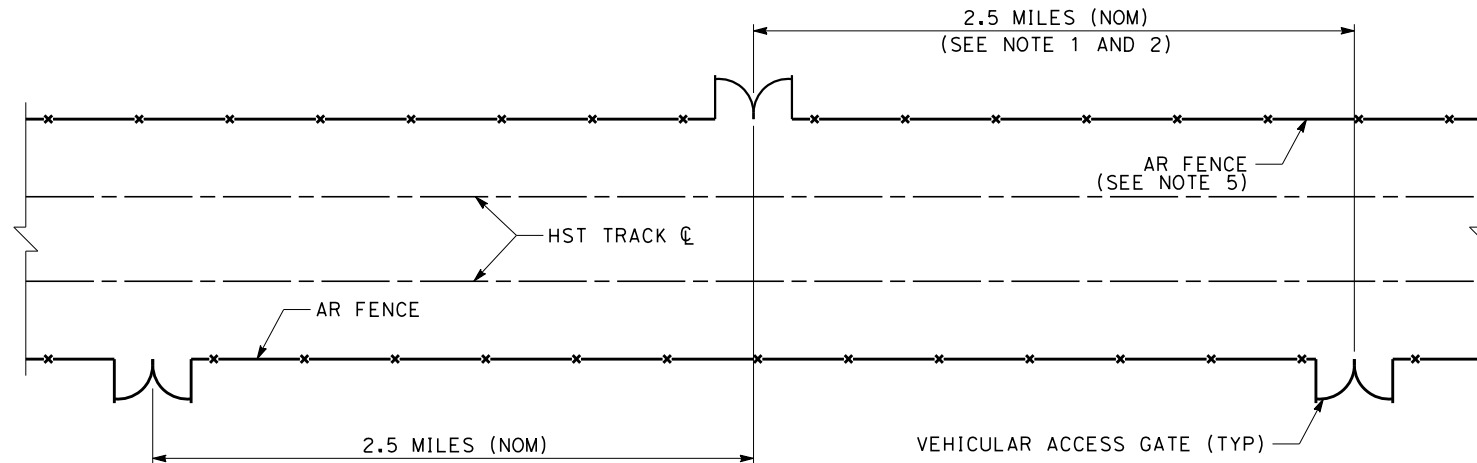


CALIFORNIA HIGH-SPEED TRAIN PROJECT  
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TYPICAL CROSS SECTION  
TWO TRACK  
TRENCH STRUCTURE

CONTRACT NO.
DRAWING NO. DD-CV-106
SCALE AS SHOWN
SHEET NO.

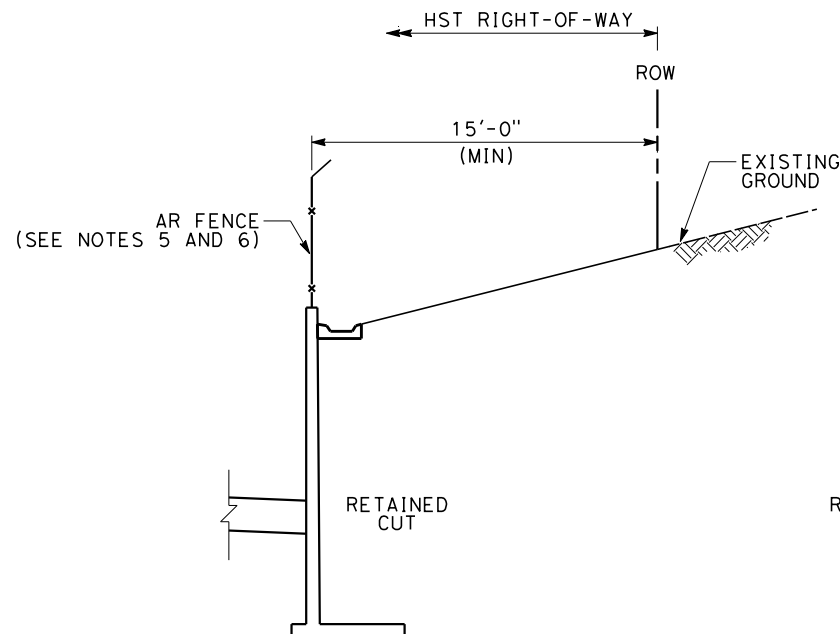
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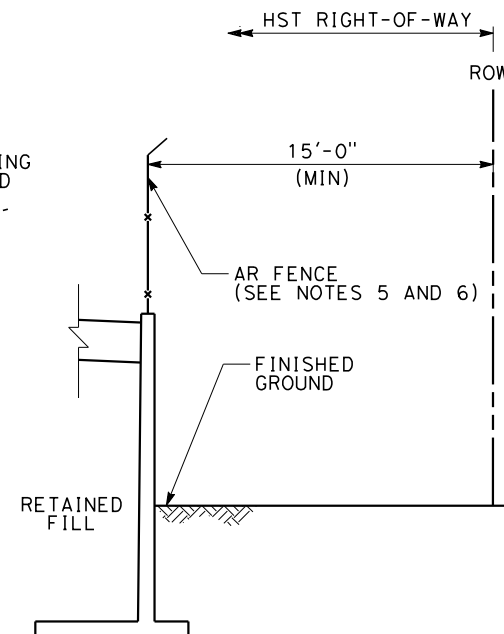
**GATE LOCATIONS ALONG HST TRACKWAY**  
AT GRADE

**NOTES:**

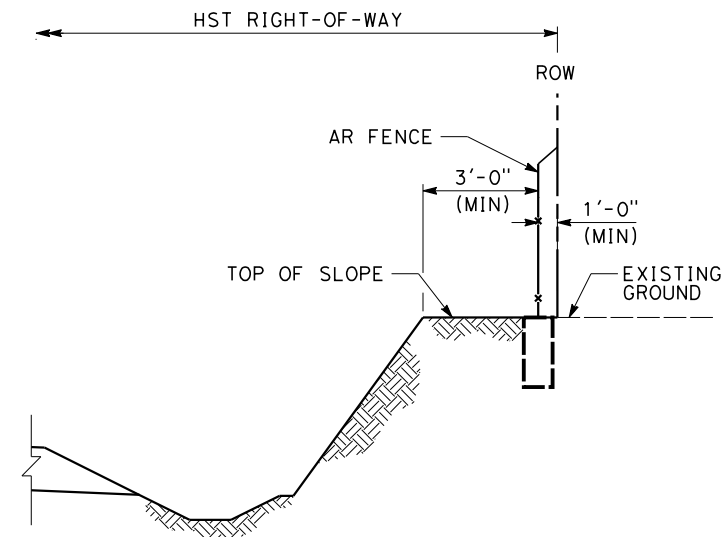
1. LOCATION OF GATES ALONG RIGHT-OF-WAY FENCING MAY REQUIRE COORDINATION WITH THE LOCAL FIRE PROTECTION AGENCY AND EMERGENCY RESPONDERS.
2. IN GENERAL VEHICULAR ACCESS GATE ALONG AT-GRADE TRACKWAY, SHALL BE LOCATED NOMINALLY AT 2.5 MILE INTERVALS AND COORDINATED WITH THE LOCATION OF HST WAYSIDE FACILITIES.
3. GATE LOCATIONS ALONG FENCING WITHIN FREEWAY RIGHT-OF-WAY REQUIRE CALTRANS APPROVAL.
4. VEHICULAR ACCESS GATES SHALL BE PROVIDED IN CONJUNCTION WITH EITHER ACCESS ROADS OR AT LOCATIONS WHERE EXISTING ROADS MAKE IT PRACTICABLE FOR MAINTENANCE AND EMERGENCY VEHICLE TO ACCESS THE TRACKWAY.
5. FOR ADDITIONAL DETAILS SEE CIVIL DRAWING "ACCESS RESTRICTION FENCE AND GATE DETAILS".
6. AD FENCE CAN BE USED IF AR FENCE IS PLACED ALONG THE RIGHT-OF-WAY OR THE HEIGHT OF THE WALL IS GREATER THAN 10 FEET. 15 FOOT MINIMUM REQUIRED TO THE FENCE WHEN AD FENCE IS PLACED ALONG THE RIGHT-OF-WAY.



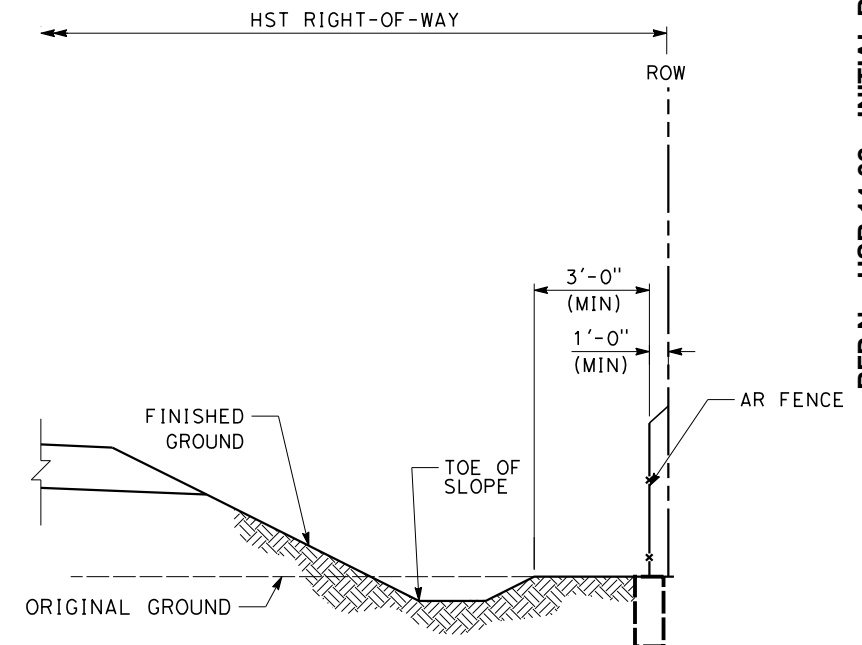
**FENCE LOCATION ALONG HST TRACKWAY**  
RETAINED CUT SECTION



**FENCE LOCATION ALONG HST TRACKWAY**  
RETAINED FILL SECTION



**FENCE LOCATION ALONG HST TRACKWAY**  
OPEN CUT SECTION



**FENCE LOCATION ALONG HST TRACKWAY**  
EMBANKMENT SECTION

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY S. MILITELLO
DRAWN BY V. LAVERDE
CHECKED BY A. ABTAHI
IN CHARGE G. LUSHEROVICH
DATE 08/29/2014

**PARSONS  
BRINCKERHOFF**



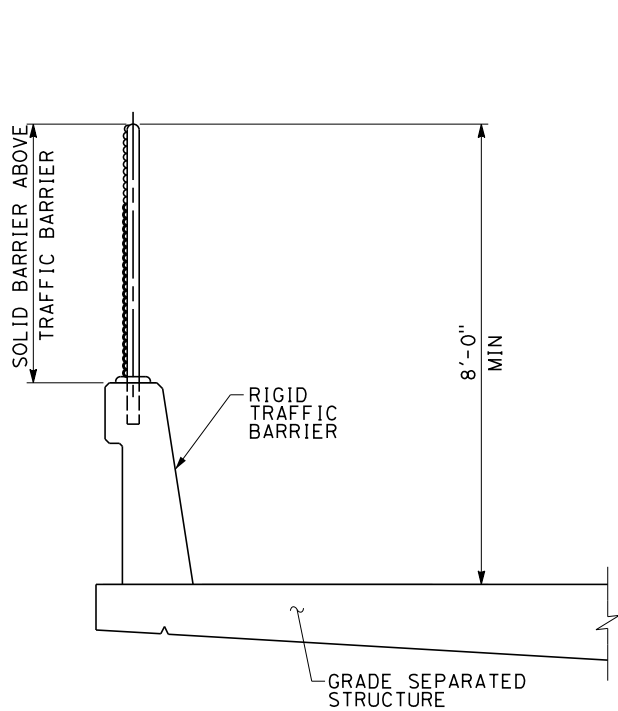
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

ACCESS RESTRICTION  
FENCE AND GATE LOCATIONS

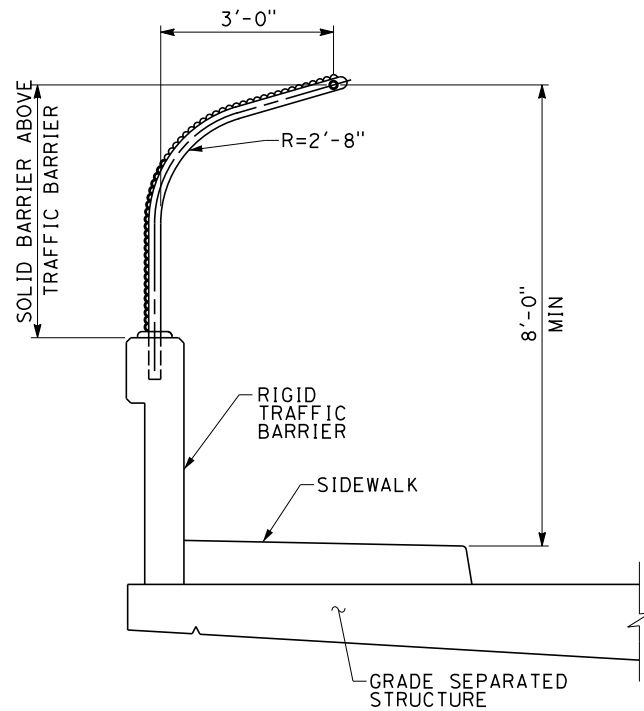
CONTRACT NO.
DRAWING NO. DD-CV-901
SCALE NO SCALE
SHEET NO.



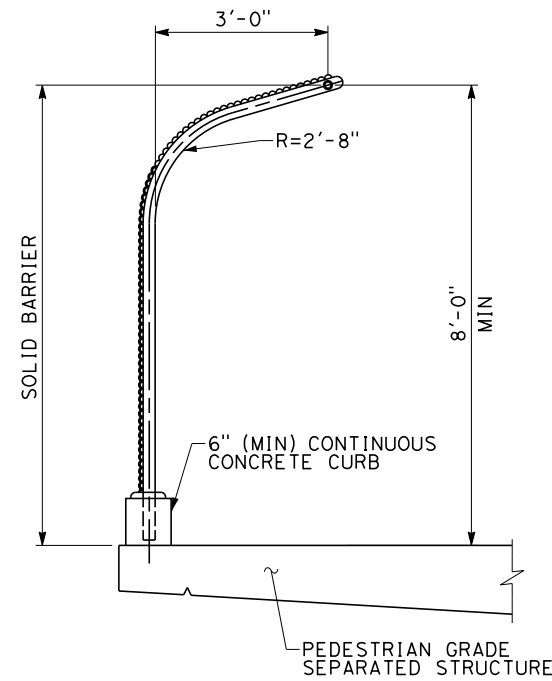
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**CROSS SECTION**  
SOLID BARRIER AT GRADE SEPARATED  
STRUCTURES WITHOUT SIDEWALK



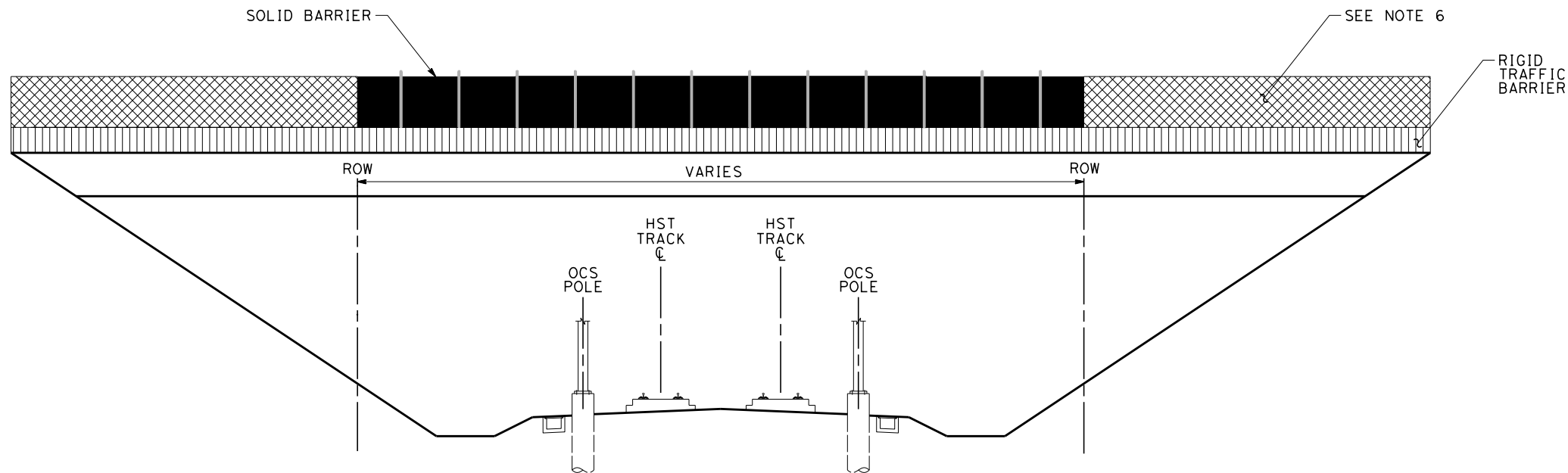
**CROSS SECTION**  
SOLID BARRIER AT GRADE SEPARATED  
STRUCTURES WITH SIDEWALK



**CROSS SECTION**  
SOLID BARRIER AT PEDESTRIAN  
GRADE SEPARATED STRUCTURE

**NOTES:**

1. TRACK, SYSTEMS, STRUCTURES AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. THE SOLID BARRIER SHALL BE AN OPAQUE SOLID PLATE WEIGHING NO MORE THAN 40 POUNDS PER LINEAR FOOT. SOLID BARRIER TO BE SUBMITTAL FOR AUTHORITY APPROVAL.
3. FOR PEDESTRIAN GRADE SEPARATED STRUCTURES A CONTINUOUS CONCRETE SURB SHALL BE USED.
4. FOR ADDITIONAL SOLID BARRIER REQUIREMENTS RELATED TO OCS, SEE OVERHEAD CONTACT SYSTEM AND TRACTION POWER RETURN SYSTEM CHAPTER OF THE DESIGN CRITERIA.
5. EXTEND SOLID BARRIER 30 FEET FROM CENTERLINE OF OUTERMOST TRACK, OR 10 FEET BEYOND THE OUTERMOST ENERGIZED CONDUCTOR OR COMPONENT, WHICHEVER IS GREATER.
6. FENCING OR RAILING AS REQUIRED BY CALTRANS OR AGENCY HAVING JURISDICTION.



**OVERHEAD STRUCTURE ELEVATION**

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. LAVERDE
CHECKED BY S. MILITELLO
IN CHARGE G. LUSHEROVICH
DATE 09/18/2015

**PARSONS  
BRINCKERHOFF**



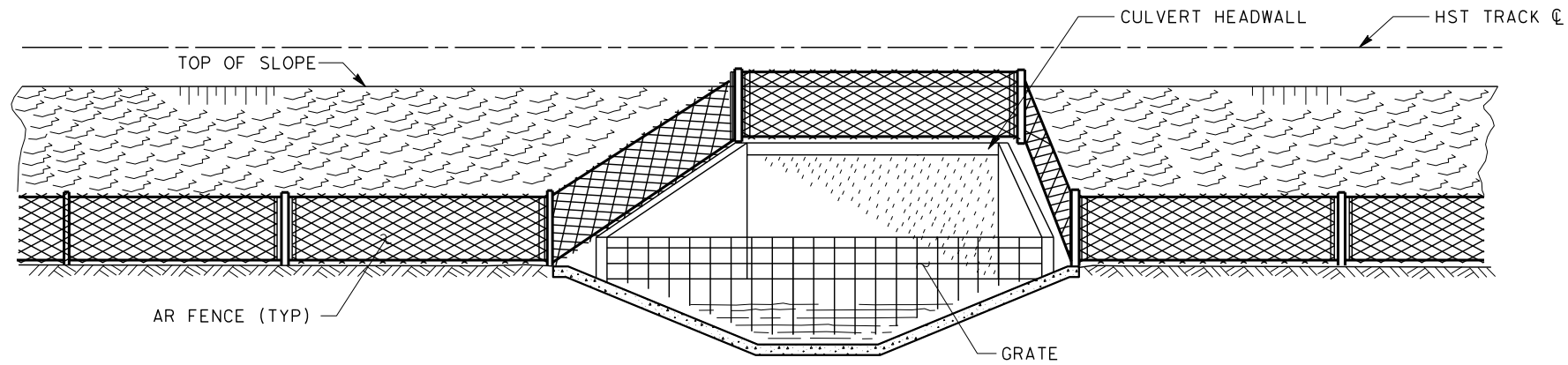
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**

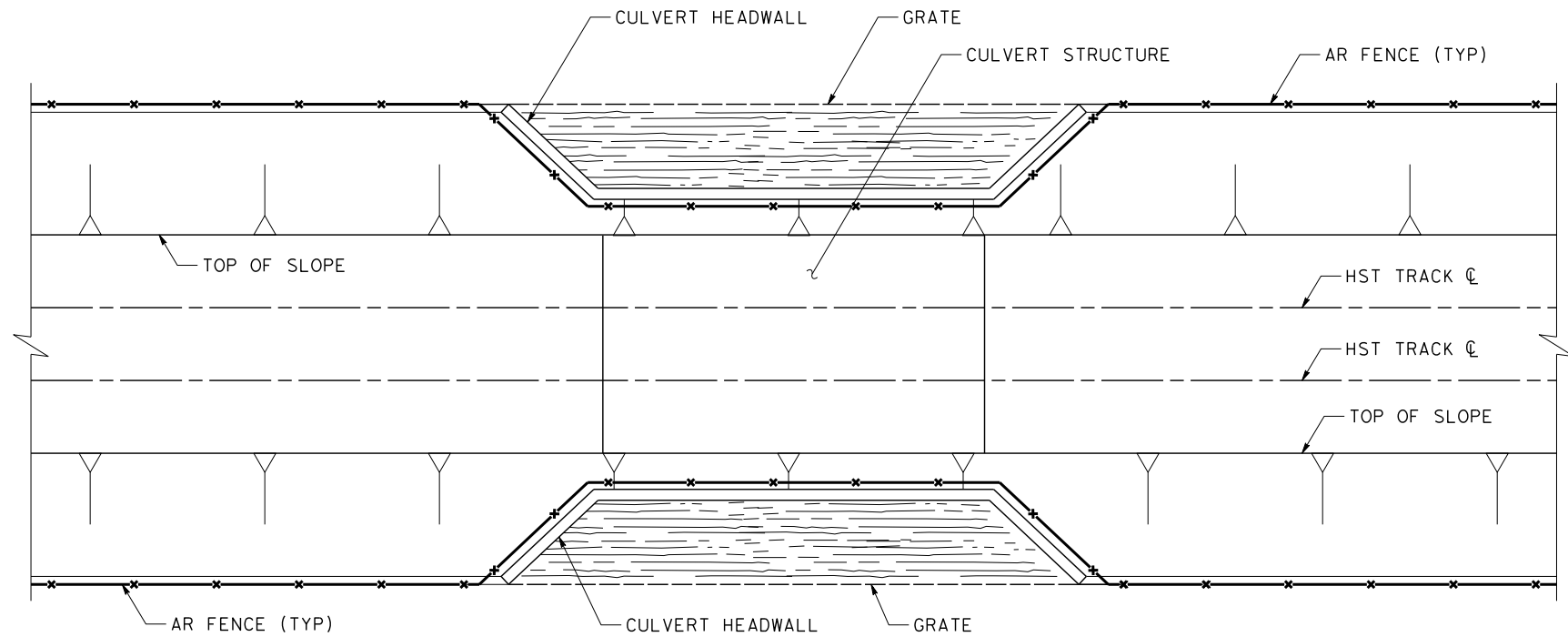
ACCESS DETERRING  
SOLID BARRIER ON GRADE SEPARATED STRUCTURES

CONTRACT NO.
DRAWING NO. DD-CV-902
SCALE NO SCALE
SHEET NO.

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ELEVATION



PLAN

NOTES:

- CULVERT STRUCTURE IS SCHEMATIC AND DOES NOT REPRESENT DESIGN.
- INSTALL GRATE IN THE CULVERT IF REQUIRED BY THREAT AND VULNERABILITY ANALYSIS, USING THE FOLLOWING CRITERIA:
  - GRATES SHALL BE INSTALLED UPSTREAM AND DOWNSTREAM OF CULVERT HEADWALLS.
  - GRATES SHALL HAVE BARS SPACED 6 INCHES APART AND SHALL BE DESIGNED TO WITHSTAND MAXIMUM IMPACT FROM LARGEST EXPECTED FLOATING DEBRIS.
  - THE MAXIMUM DISTANCE FROM THE BOTTOM OF THE GRATE TO THE BOTTOM AND SIDE SLOPES OF THE WATERWAY CROSSING SHALL BE 6 INCHES.
  - THE MINIMUM HEIGHT OF THE GRATES SHALL BE SUCH THAT IT RESTRICTS ACCESS DURING ALL CONDITIONS (DRY, HIGH WATER, ETC).
  - GRATE INSTALLATIONS SHALL BE COORDINATED WITH THE HYDRAULIC ENGINEER TO ENSURE PRESERVATION OF THE CULVERT FLOW CAPACITY.
- INSTALLATION OF GRATES IN DESIGNATED WILDLIFE CORRIDORS ARE SUBJECT TO APPROVAL BY THE APPROPRIATE REGULATORY AGENCY.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY S. MILITELLO
DRAWN BY V. HUANTE
CHECKED BY A. ABTAHI
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

PARSONS  
BRINCKERHOFF



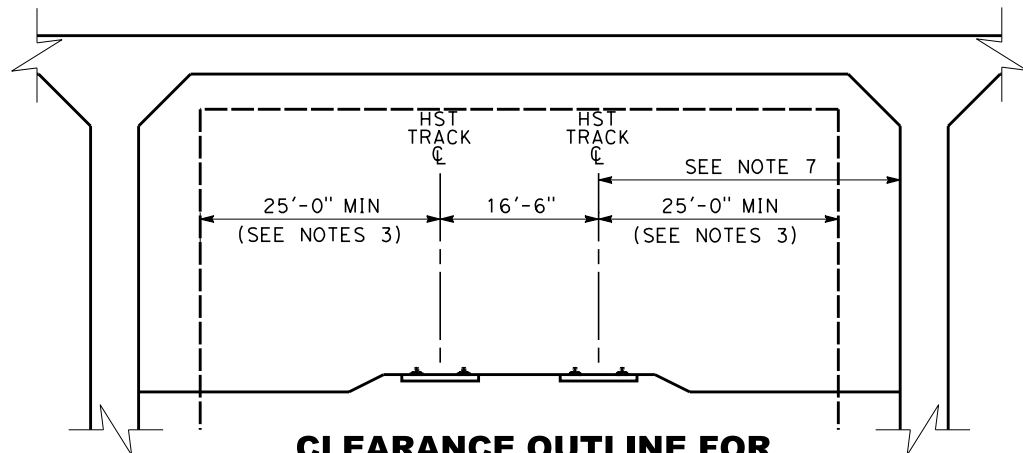
CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE

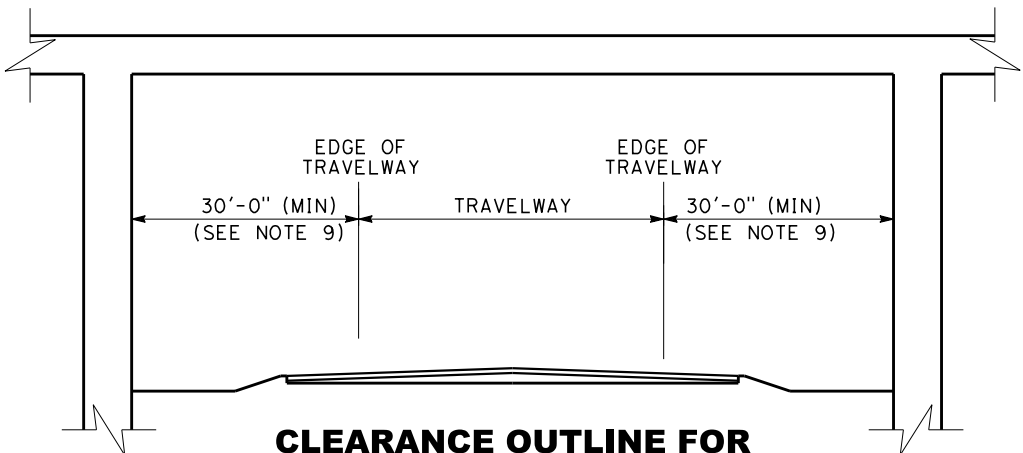
FENCE AT CULVERT CROSSINGS

CONTRACT NO.
DRAWING NO. DD-CV-903
SCALE NO SCALE
SHEET NO.

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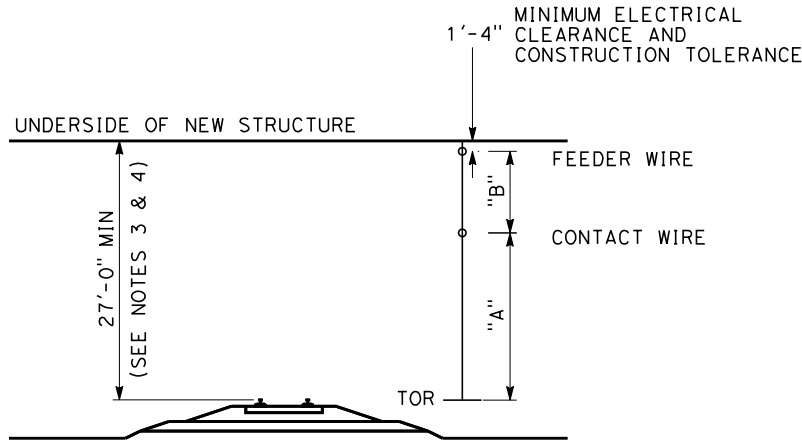
CLEARANCE OUTLINE FOR  
NEW STRUCTURE OVER HST



CLEARANCE OUTLINE FOR  
NEW HST STRUCTURE OVER ROADWAY

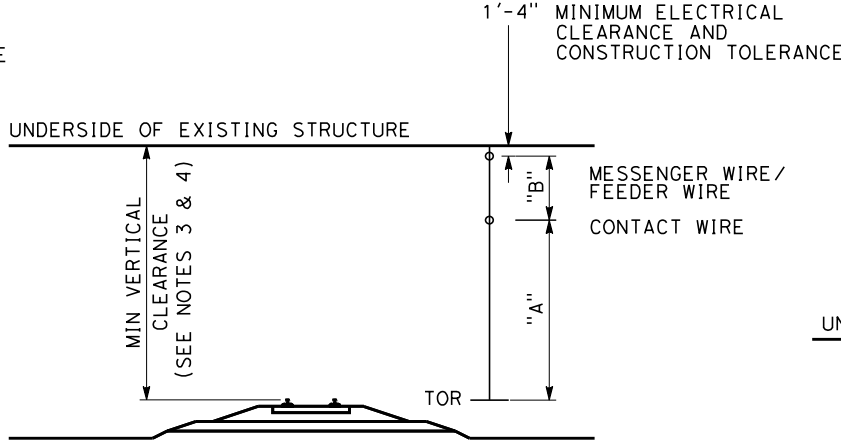
FREEWAY/EXPRESSWAY  
OTHER

MIN SIDE CLEARANCE  
30'-0"  
SEE NOTE 9



NEW STRUCTURE OVER HST TRACKS

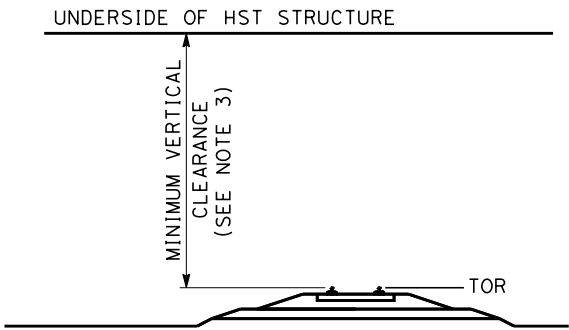
	HEIGHT "A"	HEIGHT "B"	MIN VERTICAL CLEARANCE
DEDICATED HST TRACK	17'-5"	8'-3"	27'-0"
SHARED USE TRACK	18'-9"	6'-11"	27'-0"



EXISTING STRUCTURE OVER HST TRACKS

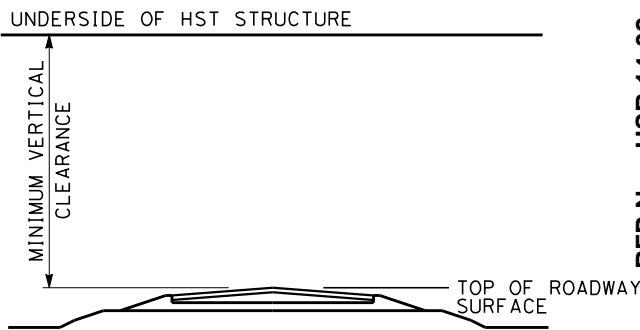
	HEIGHT "A"	HEIGHT "B"	MIN VERTICAL CLEARANCE
DEDICATED HST TRACK	17'-5"	8'-3"	27'-0"
DEDICATED HST TRACK (V ≤ 125 MPH)	17'-5"	5'-3"	24'-0"*
SHARED USE TRACK	18'-9"	4'-0"	24'-6"***

\* SEE NOTE 4  
\*\* PER CALTRAIN



NEW HST STRUCTURE OVER TRACK

	MIN VERTICAL CLEARANCE
FREIGHT TRACKS	
BNSF	23'-4"
UPRR	23'-0"
NON-FREIGHT TRACKS	
METROLINK	24'-0"
CALTRAIN	24'-6"



NEW HST STRUCTURE OVER ROADWAY

	MIN VERTICAL CLEARANCE
FREEWAY/EXPRESSWAY	16'-6"
LOCAL ROADWAY	15'-0" *
EXTRA LEGAL LOAD NETWORK(ELLN)	20'-3"
* SEE NOTE 6	

NOTES:

1. TOLERANCES ARE NOT ADDITIVE FOR INCREMENTAL DISTANCES.
2. HST TRACKFORM IS SCHEMATIC AND DOES NOT REPRESENT THE DESIGN.
3. AT LOCATIONS WHERE SUPERELEVATION IS PRESENT, VERTICAL CLEARANCES SHALL BE MEASURED FROM THE HIGH RAIL. MINIMUM VERTICAL CLEARANCES SHOULD BE CARRIED TO POINT 25 FEET Laterally FROM THE CENTERLINE OF THE MOST OUTSIDE TRACK.
4. DEFINED CLEARANCES ASSUMES GRADE SEPARATED STRUCTURE LENGTH ALONG TRACK IS NO MORE THAN 160 FEET FOR HST TRACK OVER 125 MPH. THE OCS SHALL BE FREE RUNNING UNDER GRADE SEPARATED STRUCTURES WITH NO SUPPORTS. STRUCTURES WIDER THAN 160 FEET REQUIRE FURTHER APPROVAL.
5. PROTECTIVE PANEL IS REQUIRED FOR VERTICAL CLEARANCES LESS THAN THE PANTOGRAPH ZONE HEIGHT (26 FEET - 3 INCHES) FOR STRUCTURES OVER HST TRACKS.
6. FOR LOCAL ROADWAYS, 15 FEET MINIMUM VERTICAL CLEARANCE SHALL BE CONFIRMED BY AGENCY HAVING JURISDICTION.
7. ADDITIONAL HORIZONTAL CLEARANCE SHALL BE PROVIDED AS NECESSARY TO MEET DRAINAGE AND MAINTENANCE ACCESS REQUIREMENTS PER THE CIVIL AND DRAINAGE CHAPTERS OF THE DESIGN CRITERIA.
8. PROTECTIVE TRAFFIC BARRIER REQUIREMENTS SHALL BE CONFIRMED BY AGENCY HAVING JURISDICTION. ADDITIONAL HORIZONTAL CLEARANCE SHALL BE PROVIDED AS NECESSARY TO MEET MAINTENANCE ACCESS REQUIREMENTS PER THE CIVIL CHAPTER OF THE DESIGN CRITERIA.
9. SIDE CLEARANCE DESIGN CRITERIA SHALL BE CONFIRMED BY AGENCY HAVING JURISDICTION.

RFP No.: HSR 14-32 – Addendum No. 2 - 10/09/2015

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY S. MILITELLO
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 09/18/2015

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE

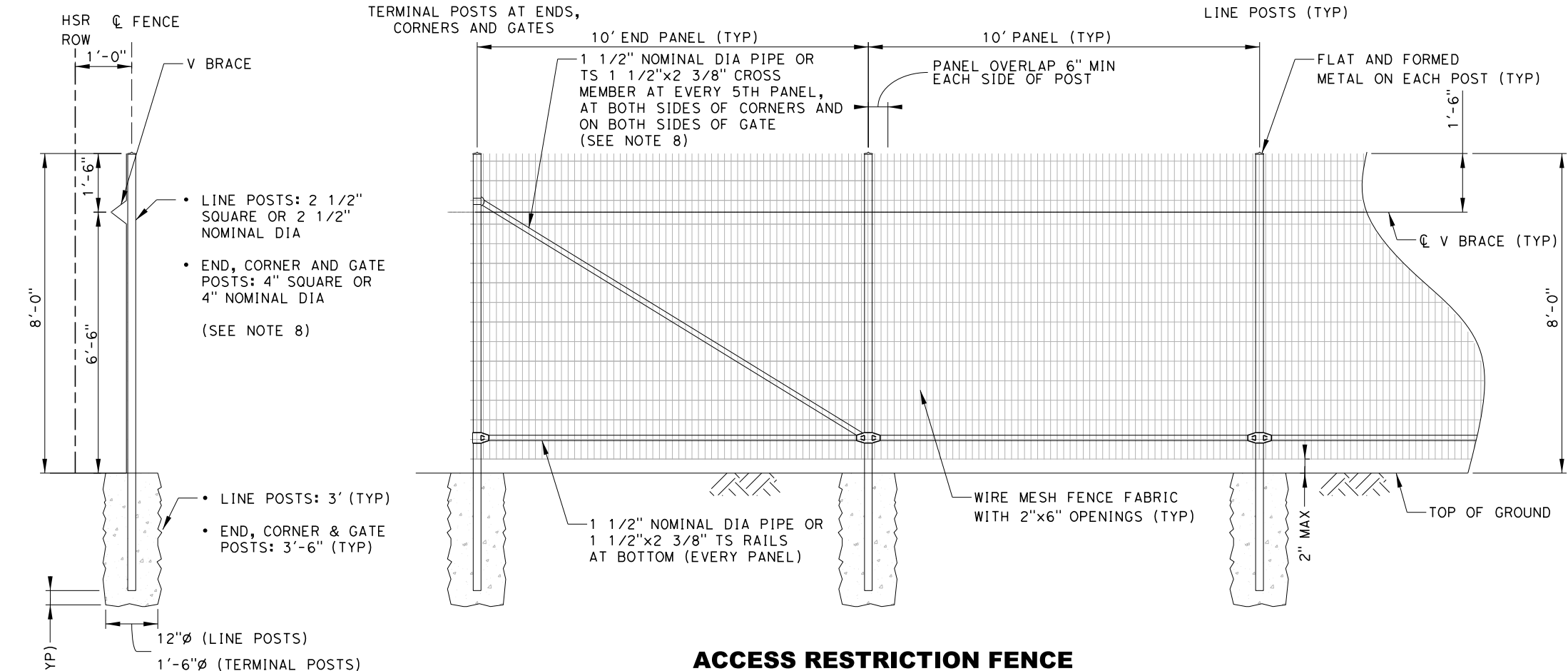
MINIMUM CLEARANCE  
GRADE SEPARATED STRUCTURES

CONTRACT NO.
DRAWING NO. DD-CV-904
SCALE NO SCALE
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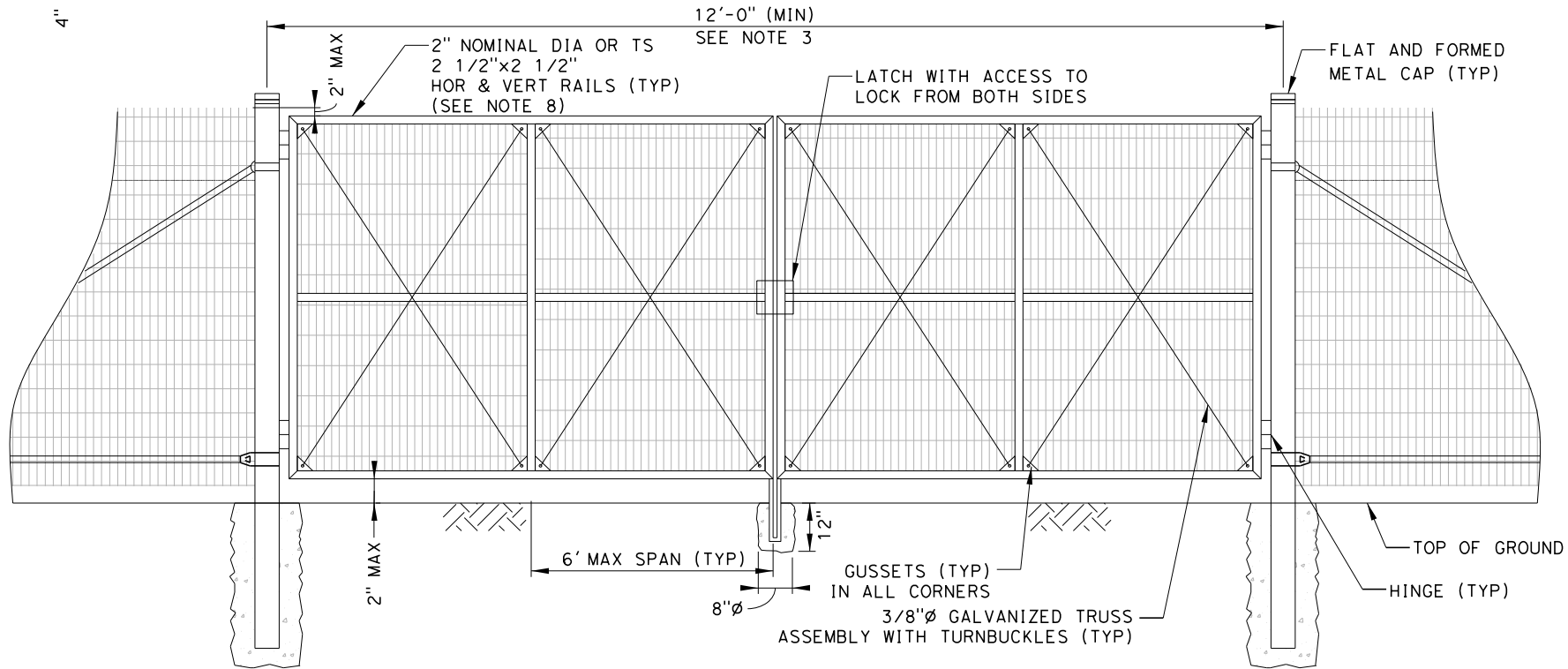
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CONTRACT NO.	
DRAWING NO.	DD-CV-905
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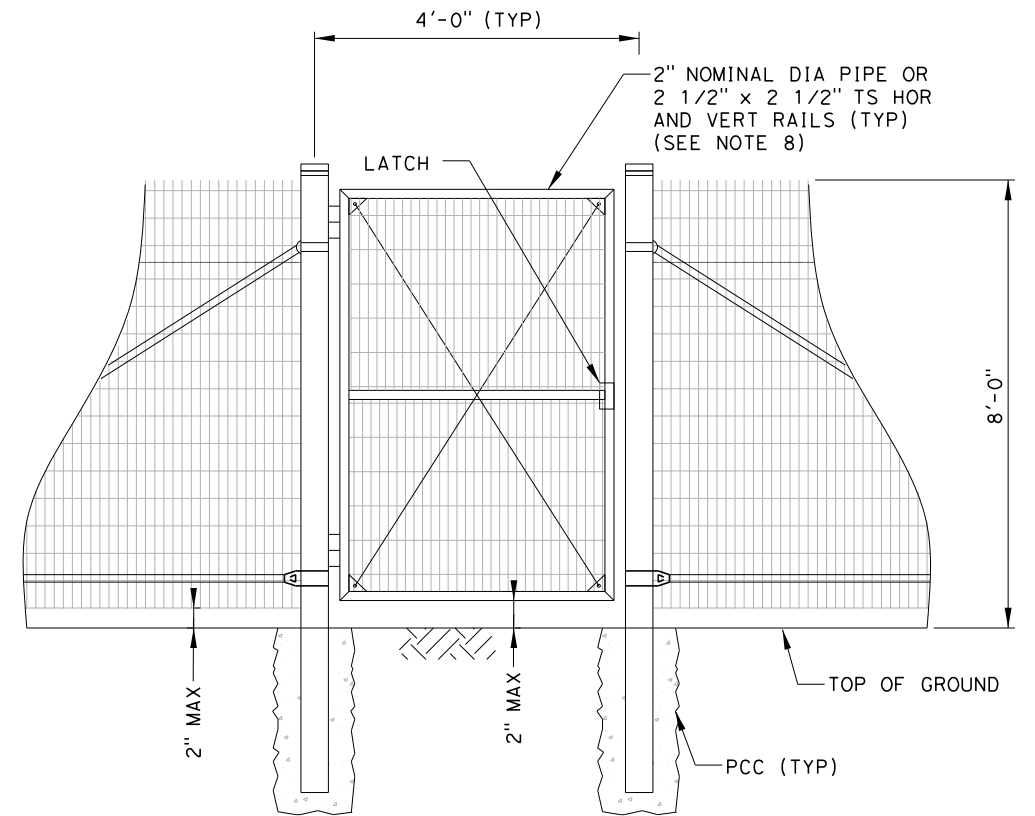
HRFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015



## ACCESS RESTRICTION FENCE



## VEHICLE ACCESS GATE ALONG AR FENCE



## PEDESTRIAN ACCESS GATE ALONG AR FENCE

- NOTES:

1. ALL PERMANENT FENCING AND GATES SHALL BE BONDED GROUNDED AND INSULATED TO PREVENT ELECTRIC SHOCK.
2. ACCESS RESTRICTION (AR) FENCING SHALL BE 8 FEET HIGH MINIMUM (AS SHOWN HERE). ACCESS DETERRENT (AD) FENCING (NOT SHOWN) SHALL BE 6 FEET HIGH.
3. GATES FOR VEHICULAR ACCESS (DRIVING GATES) SHALL BE SIZED IN COORDINATION WITH EMERGENCY RESPONDERS AND MAINTENANCE EQUIPMENT. IF NO OTHER INFORMATION IS AVAILABLE THESE GATES SHOULD HAVE A MINIMUM WIDTH OF 12 FEET.
4. GATES CAN EITHER BE SWINGING OR SLIDING TYPE. VEHICULAR ACCESS SWINGING GATES SHALL BE A PAIR AND SHALL BE HINGED FROM THE INSIDE. PROVISIONS SHALL BE MADE FOR SWINGING GATES TO SWING NOT LESS THAN 90 DEGREES AWAY FROM THE HST FACILITIES.
5. GATES SHALL BE DESIGNED AND INSTALLED TO NOT PRECLUDE FUTURE INSTALLATION OF TYPICAL FENCE MOUNTED ELECTRONIC ACCESS CONTROL.
6. WELDED WIRE MESH SHALL BE TYPHOON AND HOT GALVANIZED.
7. QUANTITY/SIZE AND TYPE OF FASTENERS, HAT BRACKETS AND GAUGE TIES SHALL BE AS PER THE MANUFACTURERS RECOMMENDATIONS.
8. TUBULAR MEMBERS ARE ACCEPTABLE ONLY IF COMPATIBLE TO WIRE MESH INSTALLATION AND APPROVED BY MANUFACTURER.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	A. ABTAHI
DRAWN BY	V. LAVERDE
CHECKED BY	S. MILITELLO
IN CHARGE	G. LUSHEROVICH
DATE	09/18/2015

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT**  
**CIVIL DIRECTIVE**  
NON-HIGH SECURITY AREA ACCESS RESTRICTION  
FENCE AND GATE DETAILS  
WELDED WIRE MESH

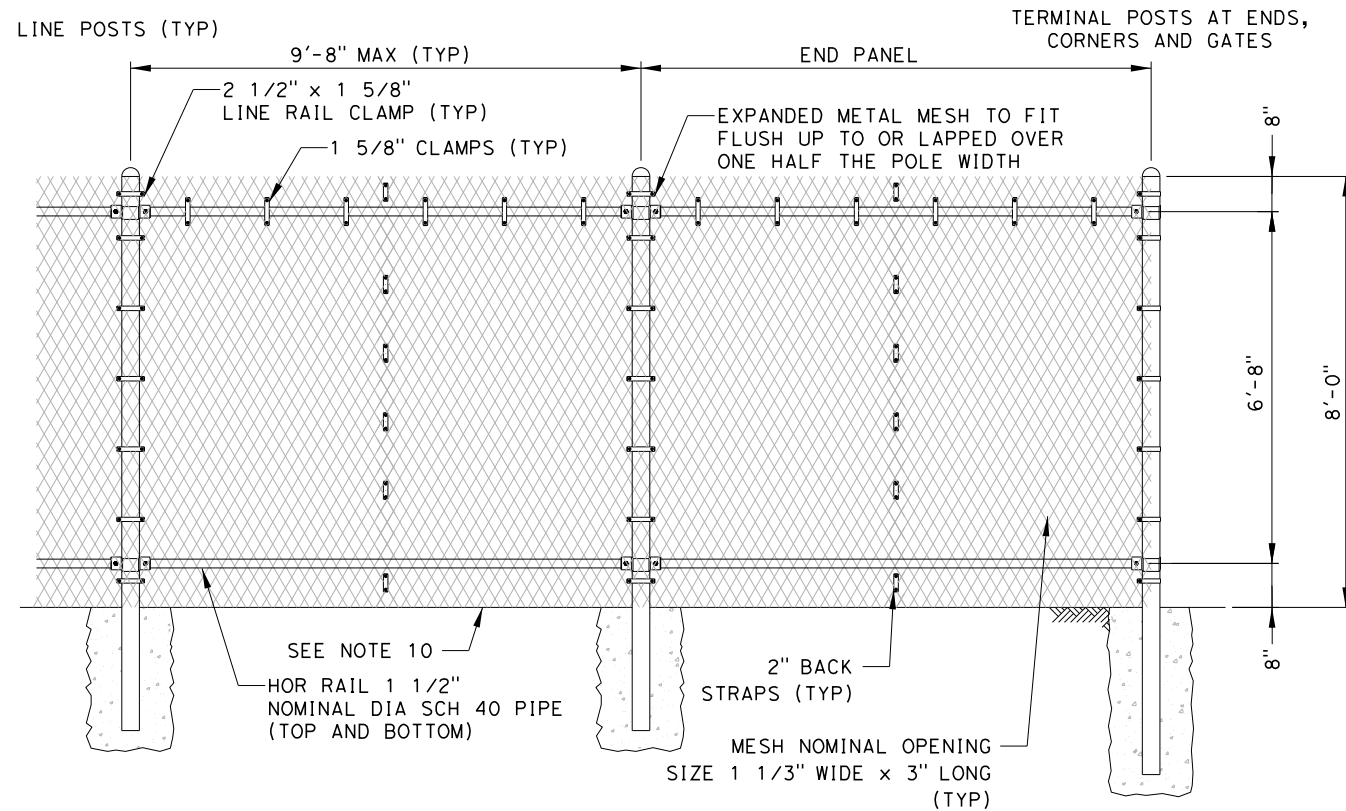
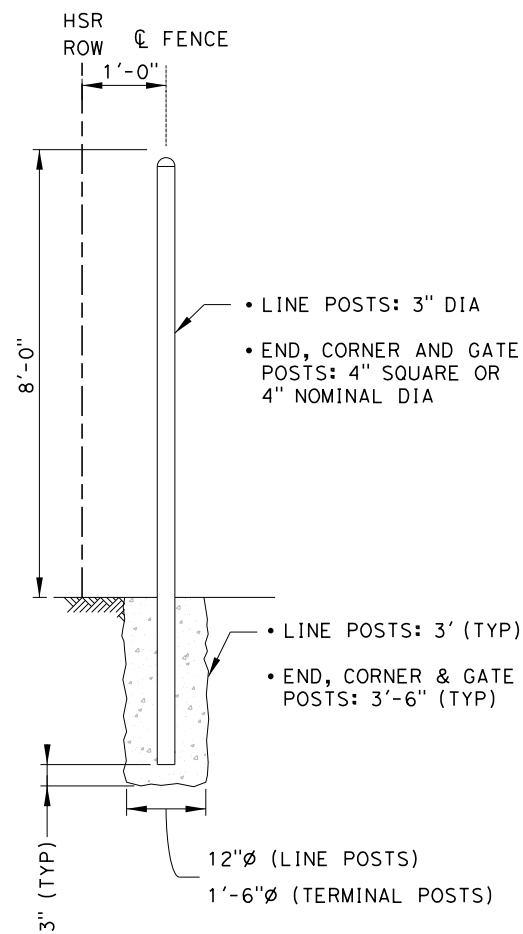
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DRAWING NO.  
DD-CV-920

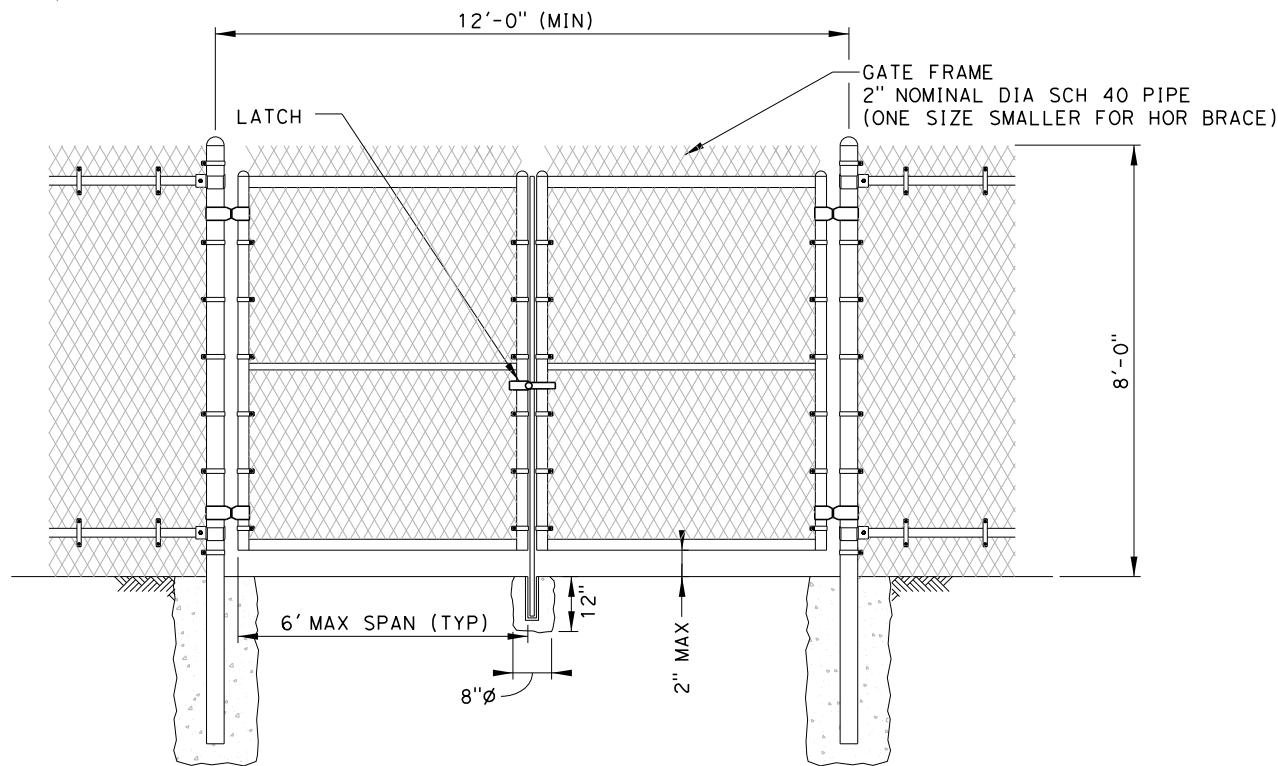
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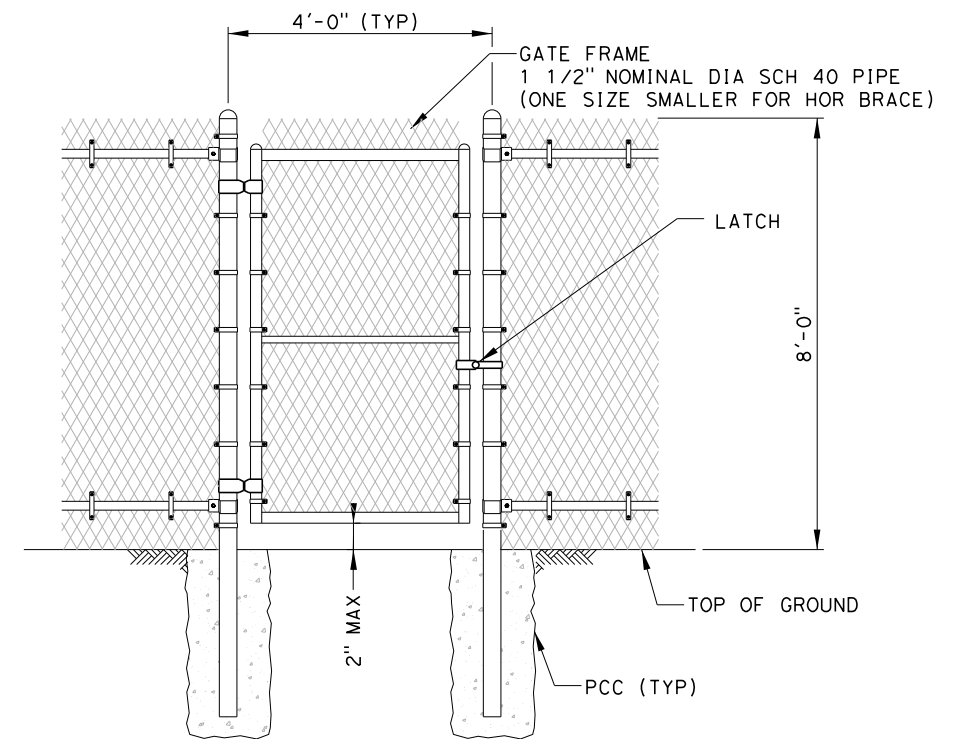
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### ACCESS RESTRICTION FENCE



### VEHICLE ACCESS GATE ALONG AR FENCE



### PEDESTRIAN ACCESS GATE ALONG AR FENCE

#### NOTES:

1. ALL PERMANENT FENCING AND GATES SHALL BE BONDED GROUND AND INSULATED TO PREVENT ELECTRIC SHOCK.
2. FENCE MESH SHALL BE SECURA 13 GAGE (REGULAR) WITH MESH DIAMOND SIZE 0.500" x 1.200" WITH MINIMUM 24 DIAMONDS PER LINEAR FOOT.
3. ACCESS RESTRICTION (AR) FENCING SHALL BE 8 FEET HIGH MINIMUM (AS SHOWN HERE). ACCESS DETERRING (AD) FENCING (NOT SHOWN) SHALL BE 6 FEET HIGH.
4. GATES FOR VEHICULAR ACCESS (DRIVING GATES) SHALL BE SIZED IN COORDINATION WITH EMERGENCY RESPONDERS AND MAINTENANCE EQUIPMENT. IF NO OTHER INFORMATION IS AVAILABLE THESE GATES SHOULD HAVE A MINIMUM WIDTH OF 12 FEET.
5. GATES CAN EITHER BE SWINGING OR SLIDING TYPE. VEHICULAR ACCESS SWINGING GATES SHALL BE A PAIR AND SHALL BE HINGED FROM THE INSIDE. PROVISIONS SHALL BE MADE FOR SWINGING GATES TO SWING NOT LESS THAN 90 DEGREES AWAY FROM THE HST FACILITIES.
6. GATES SHALL BE DESIGNED AND INSTALLED TO NOT PRECLUDE FUTURE INSTALLATION OF TYPICAL FENCE MOUNTED ELECTRONIC ACCESS CONTROL.
7. WELDED WIRE MESH SHALL BE HOT GALVANIZED.
8. QUANTITY/SIZE AND TYPE OF FASTENERS, HAT BRACKETS AND GAUGE TIES SHALL BE AS PER THE MANUFACTURERS RECOMMENDATIONS.
9. TUBULAR MEMBERS ARE ACCEPTABLE ONLY IF COMPATIBLE TO EXPANDED METAL MESH INSTALLATION AND APPROVED BY MANUFACTURER.
10. FENCE FABRIC SHALL BE BURIED MINIMUM OF 1 FOOT INTO THE GROUND.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. LAVERDE
CHECKED BY S. MILITELLO
IN CHARGE G. LUSHEROVICH
DATE 09/18/2015

**PARSONS  
BRINCKERHOFF**

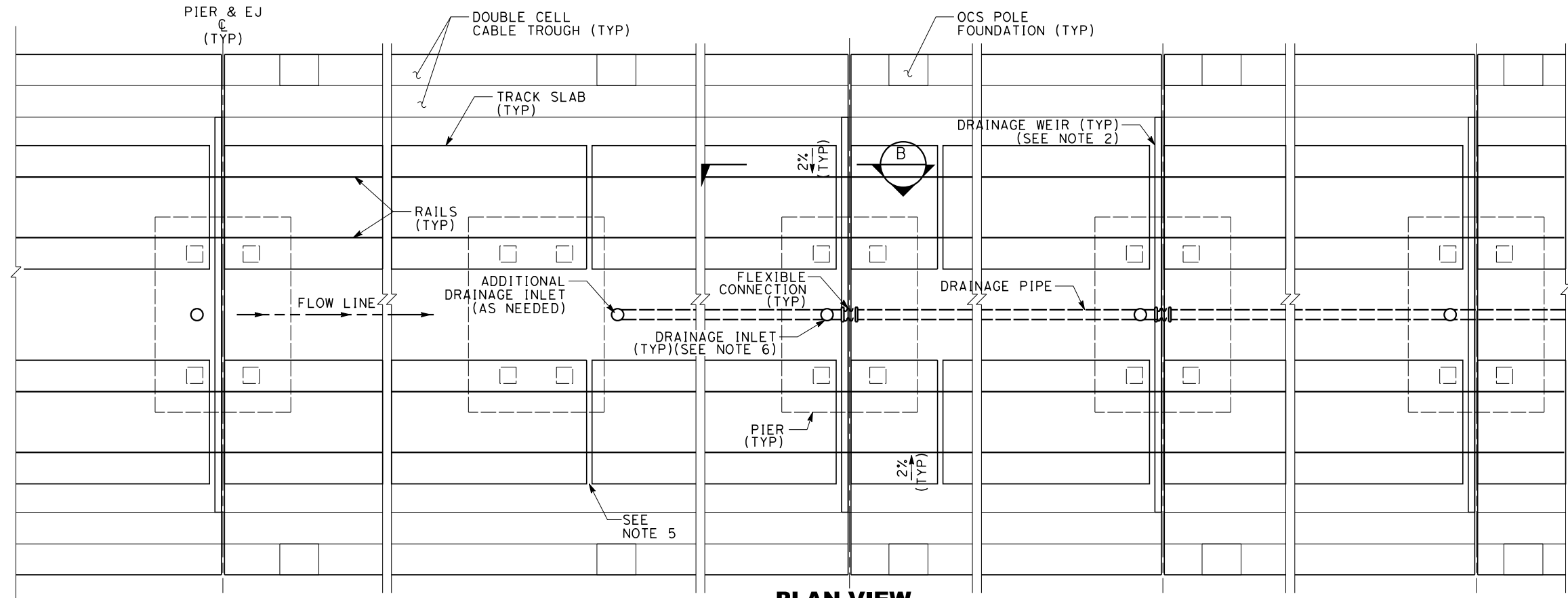


**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

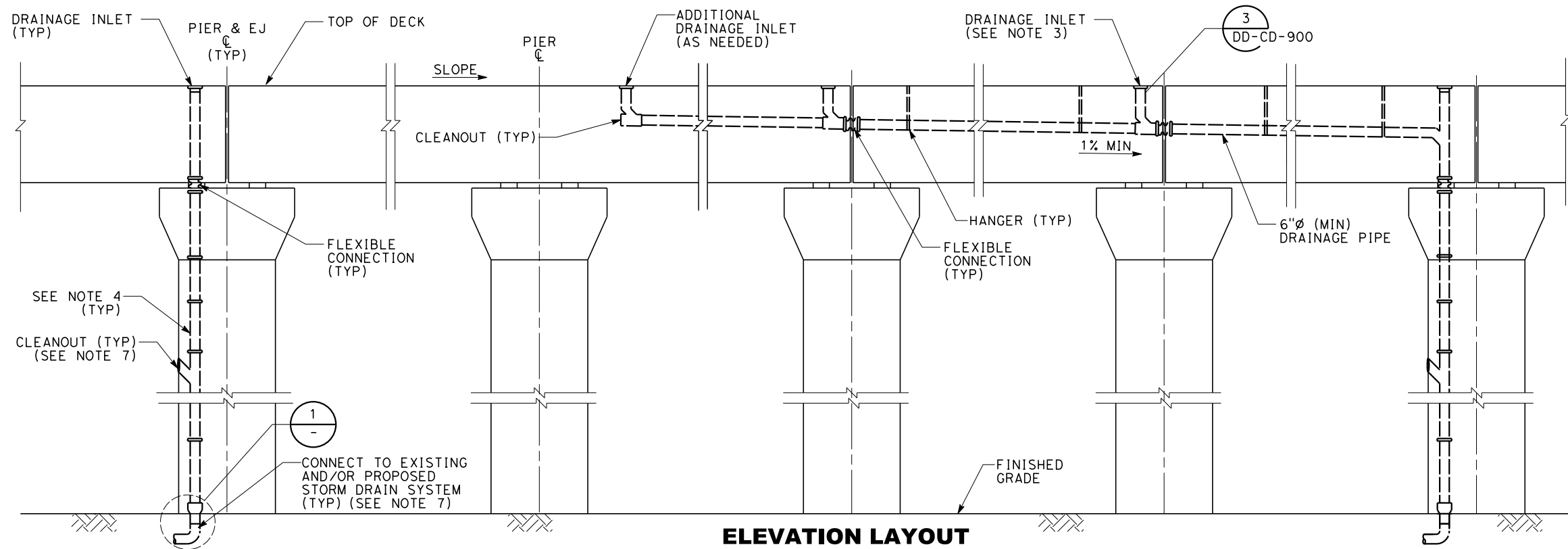
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
CIVIL DIRECTIVE**  
ACCESS RESTRICTION FENCE AND GATE DETAILS  
HIGH SECURITY AREA  
EXPANDED METAL MESH

CONTRACT NO.
DRAWING NO. DD-CV-921
SCALE NO SCALE
SHEET NO.

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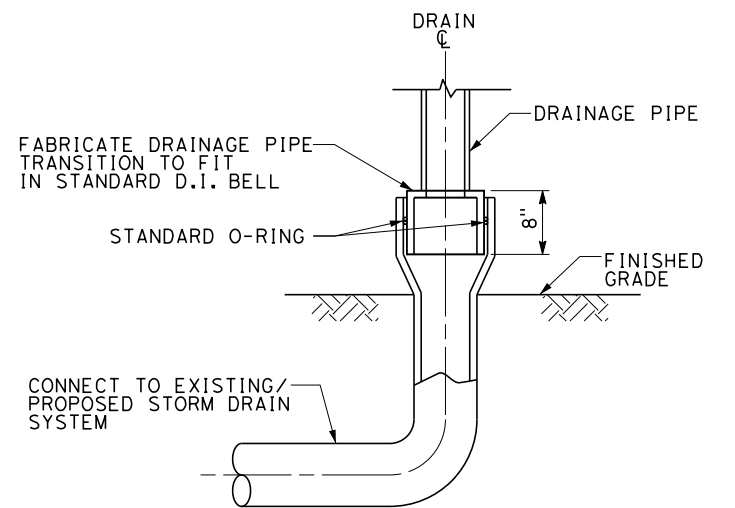
PLAN VIEW



ELEVATION LAYOUT

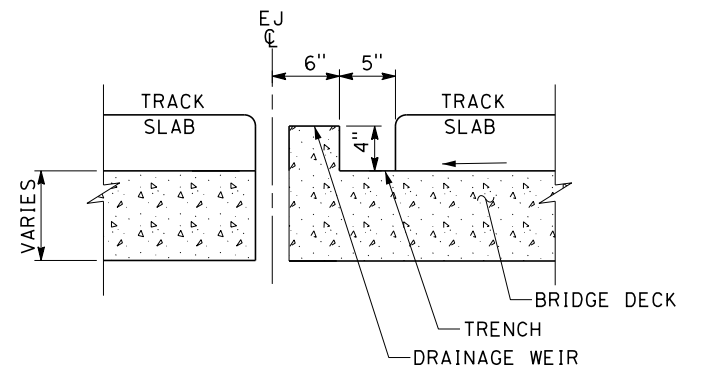
NOTES:

1. TRACK, SYSTEMS AND STRUCTURES ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. WEIR AND INLET SHALL BE PROVIDED UPSTREAM OF EVERY EXPANSION JOINT.
3. IF DOWNSPOUT IS NOT FEASIBLE AT EXPANSION JOINT, COLUMN CONNECTED STORM WATER MAY BE CONVEYED THROUGH DRAINAGE PIPE, USING FLEXIBLE CONNECTIONS AT EXPANSION JOINTS, UNTIL DOWNSPOUT CAN BE CONNECTED TO EXISTING/ PROPOSED STORM DRAIN SYSTEM.
4. PROVIDE MINIMUM 1'-6" GAP BETWEEN PVC PIPE AND FACE OF COLUMN WALL.
5. PROVIDE A 5-INCH WIDE GAP IN TRACK SLAB, 20'-0" ON CENTER AND ONE JUST UPSTREAM OF THE WEIR, SEE DETAIL.
6. REFER TO DRAINAGE DRAWING "AERIAL STRUCTURE BRIDGE DECK DRAINAGE INLET DETAIL" FOR DRAINAGE INLET DETAIL.
7. CLEANOUTS AND PIPE PENETRATIONS FROM THE COLUMNS SHALL FOLLOW THE "COLUMN REINFORCEMENT AT DRAIN OUTLET" OF CALTRANS BRIDGE DESIGN AID 17-1, DECK DRAINAGE DESIGN.



TRANSITION DETAIL

NO SCALE



SECTION

NO SCALE

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SISTLA
DRAWN BY V. HUANTE
CHECKED BY A. ABTAHI
IN CHARGE G. LUSHEROVICH
DATE 08/10/2015

PARSONS  
BRINCKERHOFF

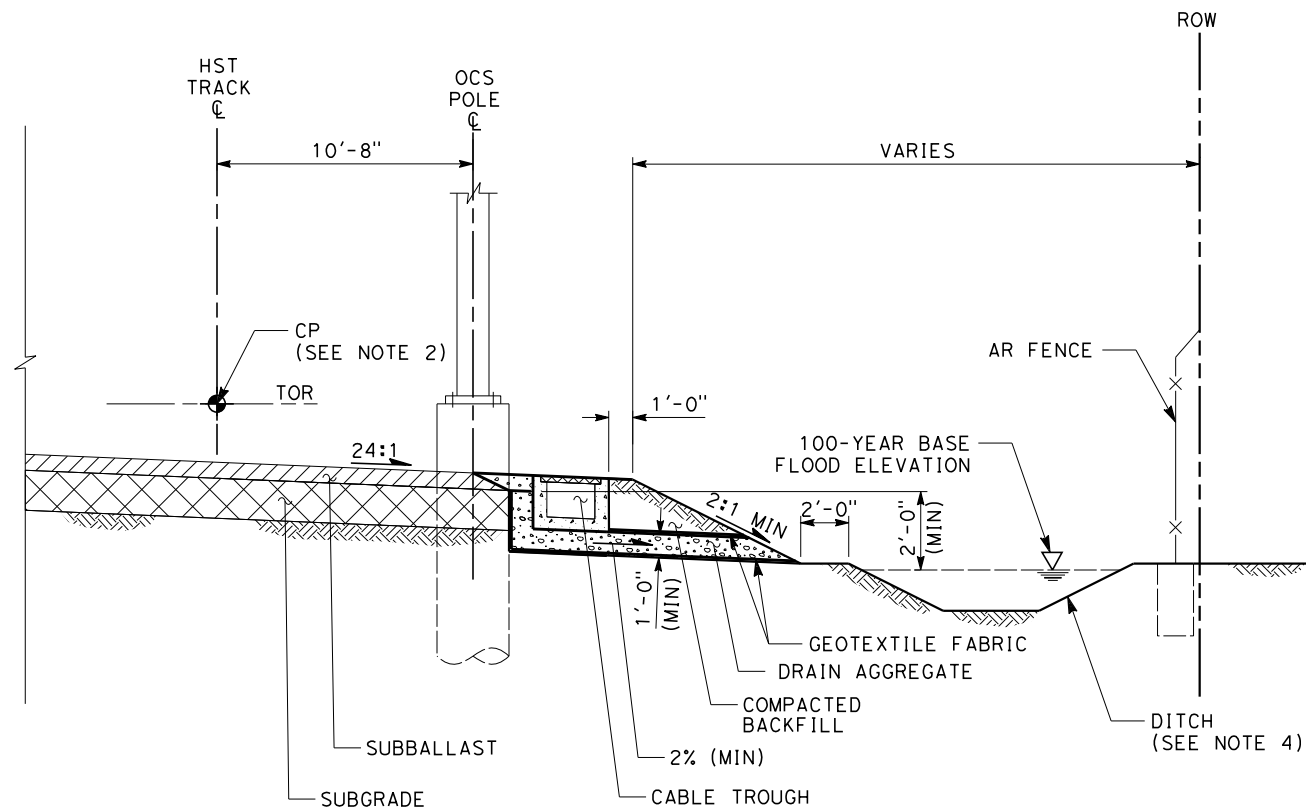


CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DRAINAGE DIRECTIVE

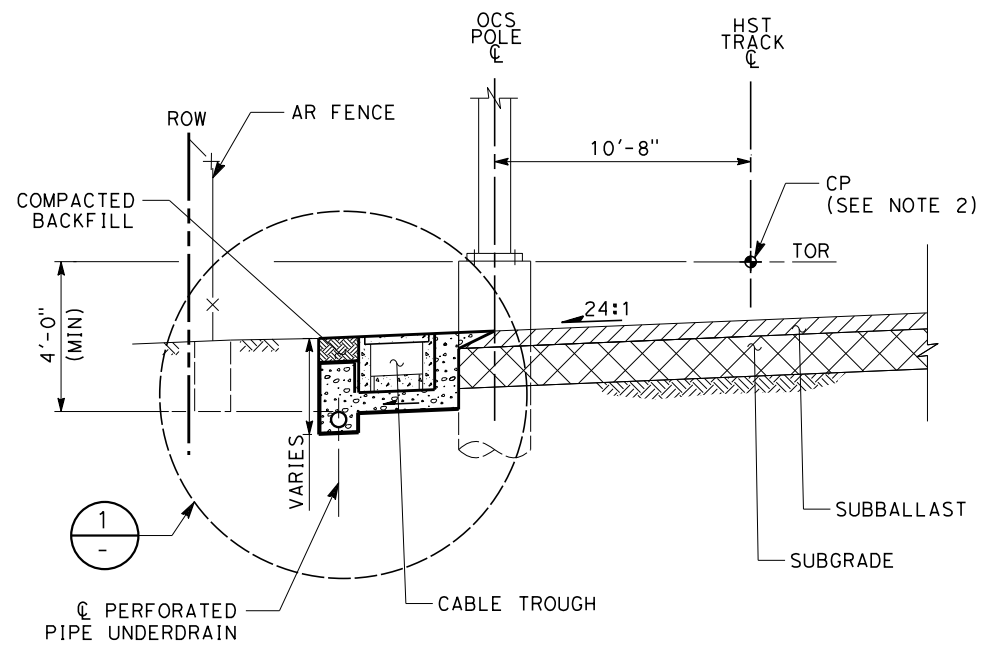
NON-BALLASTED AERIAL STRUCTURE  
DECK DRAINAGE SYSTEM

CONTRACT NO.
DRAWING NO. DD-CD-001
SCALE NO SCALE
SHEET NO.



### TYPICAL SECTION

#### AT GRADE TRACK OPEN DRAINAGE SYSTEM

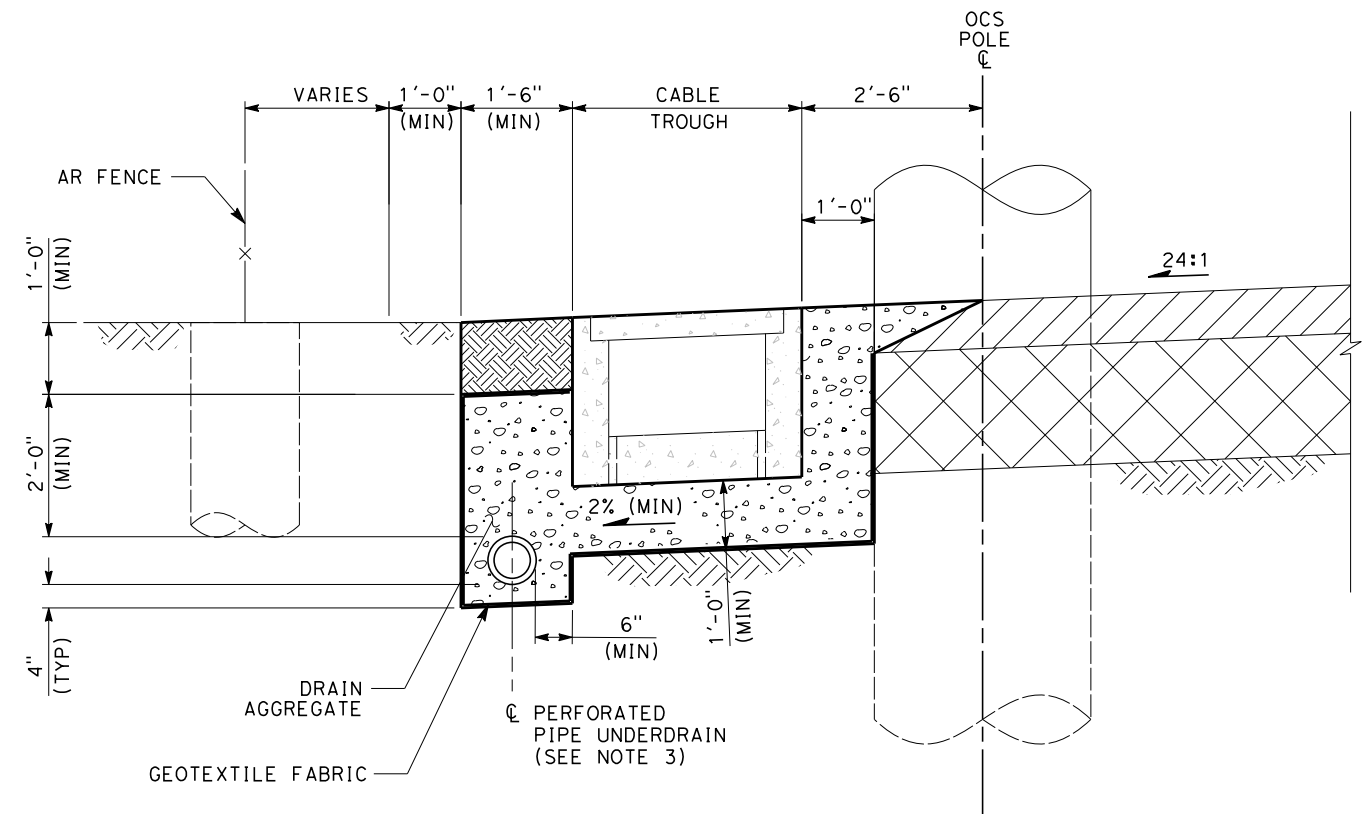


### TYPICAL SECTION

#### AT GRADE TRACK CLOSED DRAINAGE SYSTEM

- NOTES:

1. TRACK AND SYSTEMS ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. THE CONTROL POINT (CP) IS THE INTERSECTION OF THE CENTERLINE OF TRACK AND THE TOP OF THE RAIL, FOR SUPERELEVATED TRACK SECTIONS THE CP IS THE INTERSECTION OF THE CENTERLINE OF THE TRACK AND THE TOP OF THE LOW RAIL.
3. TRACK DRAINAGE SYSTEM SHALL BE CONNECTED AND DISCHARGE TO THE LOCAL STORM DRAIN SYSTEM.
4. DITCH SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:  
DEPTH OF DITCH = 1' MINIMUM  
SIDE SLOPE =  
2:1 MAXIMUM FOR CONCRETE LINED DITCH AND  
3:1 MAXIMUM FOR GRASS LINED DITCH  
WIDTH OF FLAT BOTTOM = 4' MINIMUM



**DETAIL**   
NO SCALE

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	K. SISTLA
DRAWN BY	V. HUANTE
CHECKED BY	A. ABTAHI
IN CHARGE	G. LUSHEROVICH
DATE	05/09/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

## CALIFORNIA HIGH-SPEED TRAIN PROJECT DRAINAGE DIRECTIVE

## AT-GRADE TRACK DRAINAGE SYSTEM

CONTRACT NO.

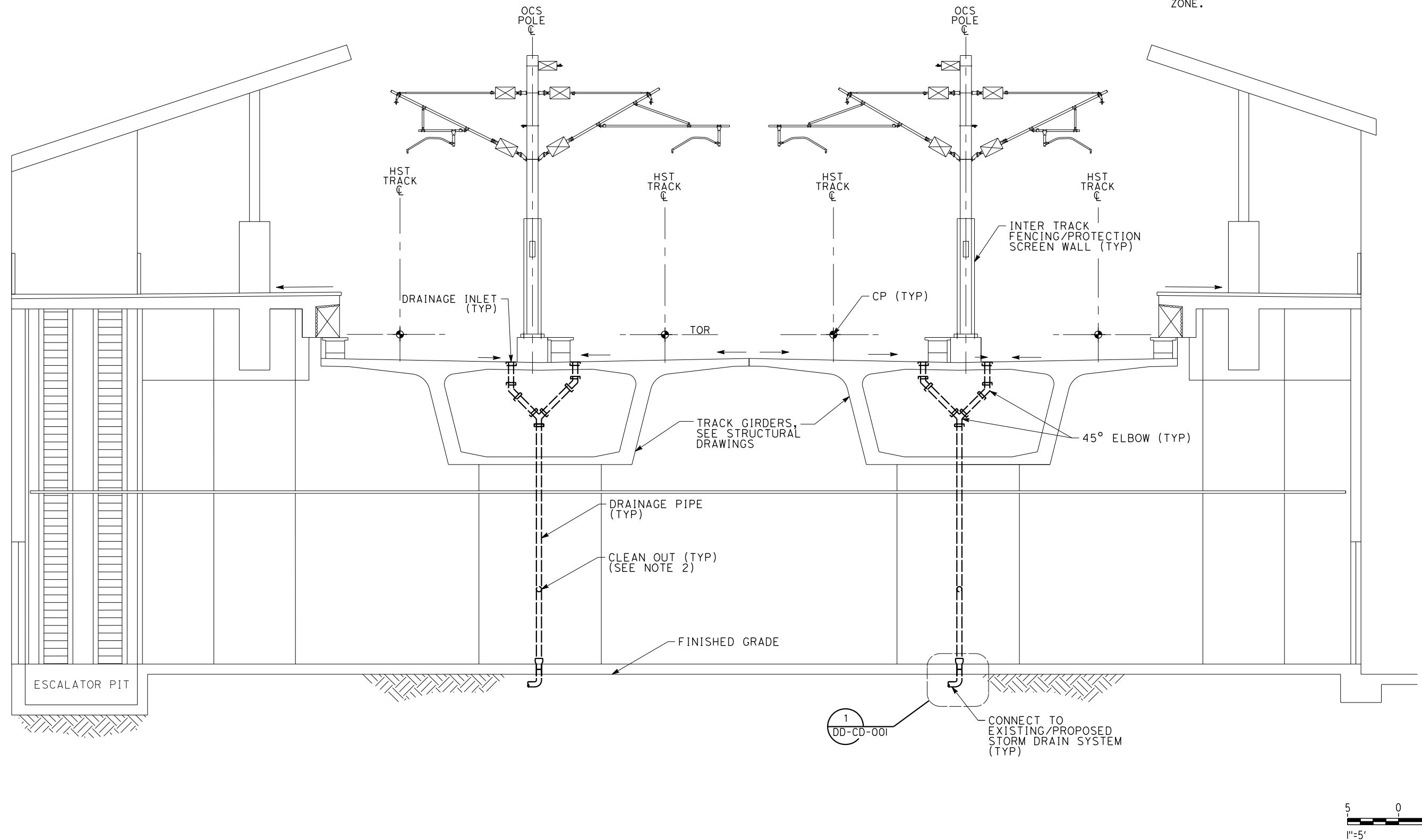
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NO SCALE

SHEET NO.



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**NOTES:**

1. TRACK, SYSTEMS AND STRUCTURES ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. CLEANOUTS AND PIPE PENETRATIONS FROM THE COLUMNS SHALL BE OUTSIDE OF THE PLASTIC HINGE ZONE.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY K. SISTLA
DRAWN BY V. HUANTE
CHECKED BY A. ABTAHI
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

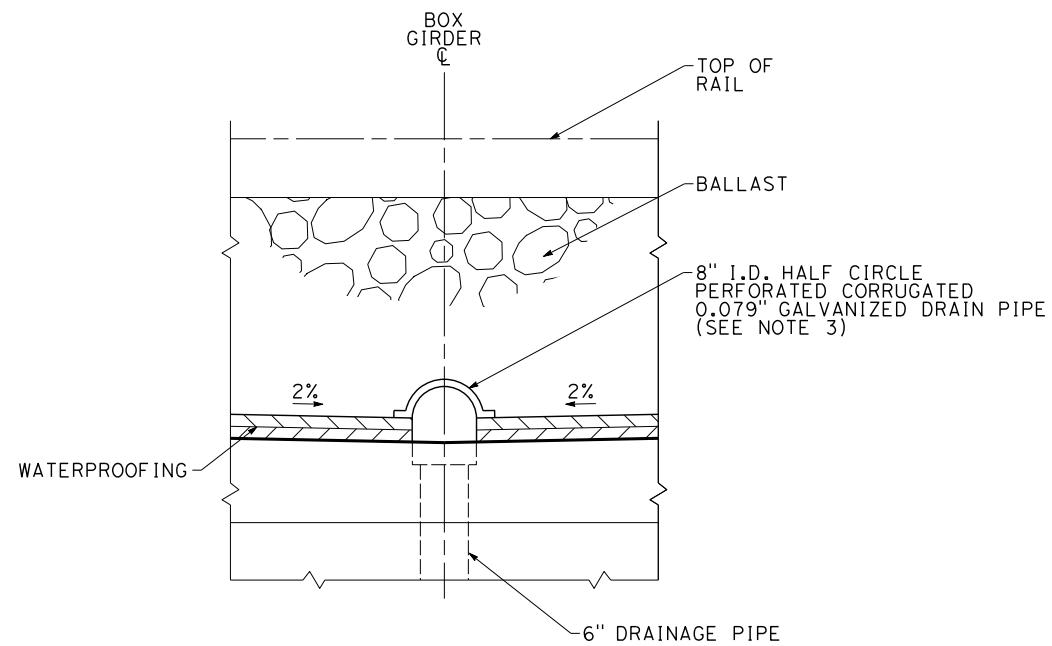
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DRAINAGE DIRECTIVE**

ELEVATED STATION PLATFORM  
DRAINAGE SYSTEM

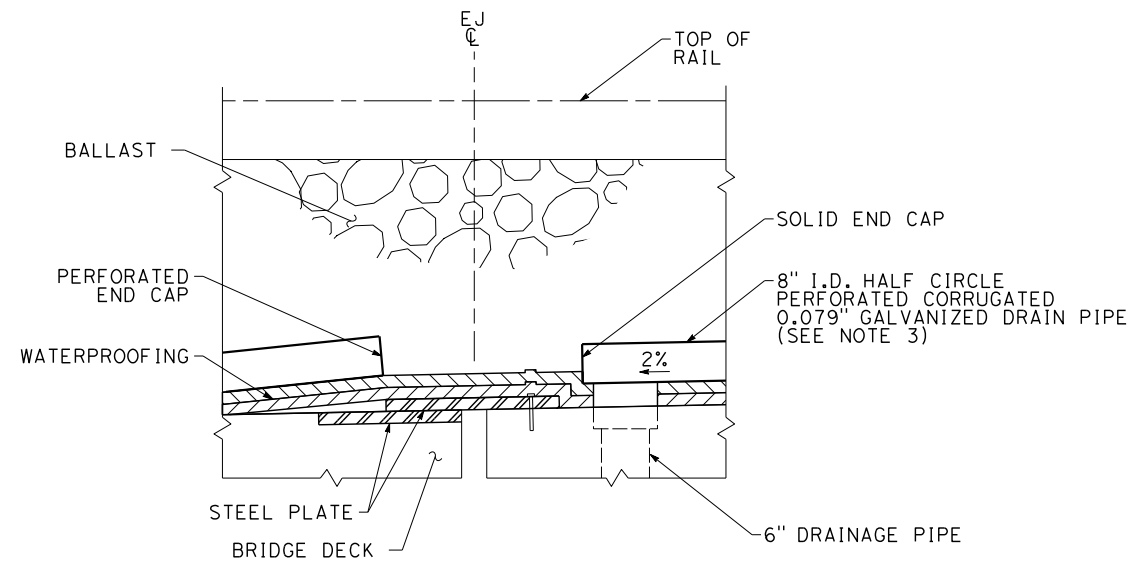
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SCALE AS SHOWN
SHEET NO.

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

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1 **DRAIN DETAIL**  
- ON CONCRETE DECK



2 **EXPANSION JOINT DETAIL**  
- ON BALLASTED AERIAL STRUCTURE

**NOTES:**

1. TRACK, SYSTEMS AND STRUCTURES ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. FOR DRAINAGE SYSTEM DETAILS SEE DD-CD-001.
3. THE 8" HALF CIRCLE PERFORATED PIPE SHALL BE INSTALLED ALONG THE ENTIRE INVERTED CROWN OF THE BRIDGE DECK, EXCEPT AT THE EXPANSION JOINT.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



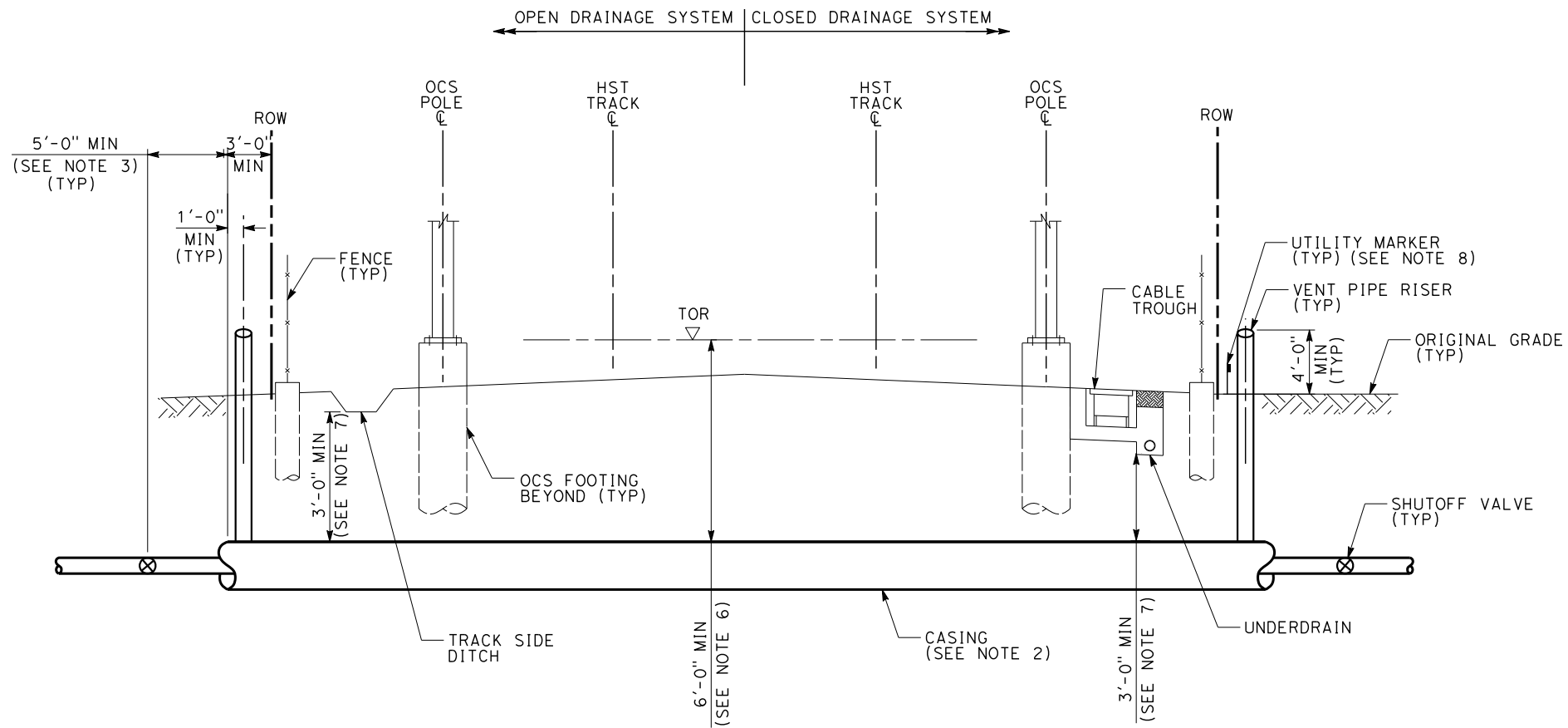
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
DRAINAGE DIRECTIVE**

BALLASTED AERIAL STRUCTURE  
DECK DRAINAGE SYSTEM DETAILS

CONTRACT NO. 13259
DRAWING NO. DD-CD-901
SCALE NO SCALE
SHEET NO.

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- NOTES:**
1. TRACK, SYSTEMS, DRAINAGE, AND STRUCTURES ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. FOR ADDITIONAL REQUIREMENTS, SEE AREMA MANUAL.
  3. SHUTOFF VALVE MUST BE ACCESSIBLE FROM OUTSIDE THE RIGHT OF WAY. IT MAY NOT BE REQUIRED ON BOTH SIDES.
  4. THE CASING SHALL CONTINUE 3'-0" BEYOND THE RIGHT OF WAY.
  5. TRANSVERSE UTILITIES SHALL BE LOCATED AWAY FROM MANHOLES, OCS FOOTINGS, AND OTHER HST SUBSURFACE ELEMENTS.
  6. MINIMUM CLEARANCE FOR GAS TRANSMISSION PIPELINE CROSSING SHALL BE 10'-6" BELOW TOP OF RAIL.
  7. MINIMUM CLEARANCE FOR UNDERGROUND WIRE LINE CROSSING, OVER 750 VOLTS, SHALL BE 4'-0" AND FOR GAS TRANSMISSION PIPELINE CROSSING SHALL BE 6'-0" BELOW DRAINAGE FACILITIES.
  8. UTILITY MARKER TO INDICATE LOCATION OF UTILITY CROSSING AT RIGHT-OF-WAY.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



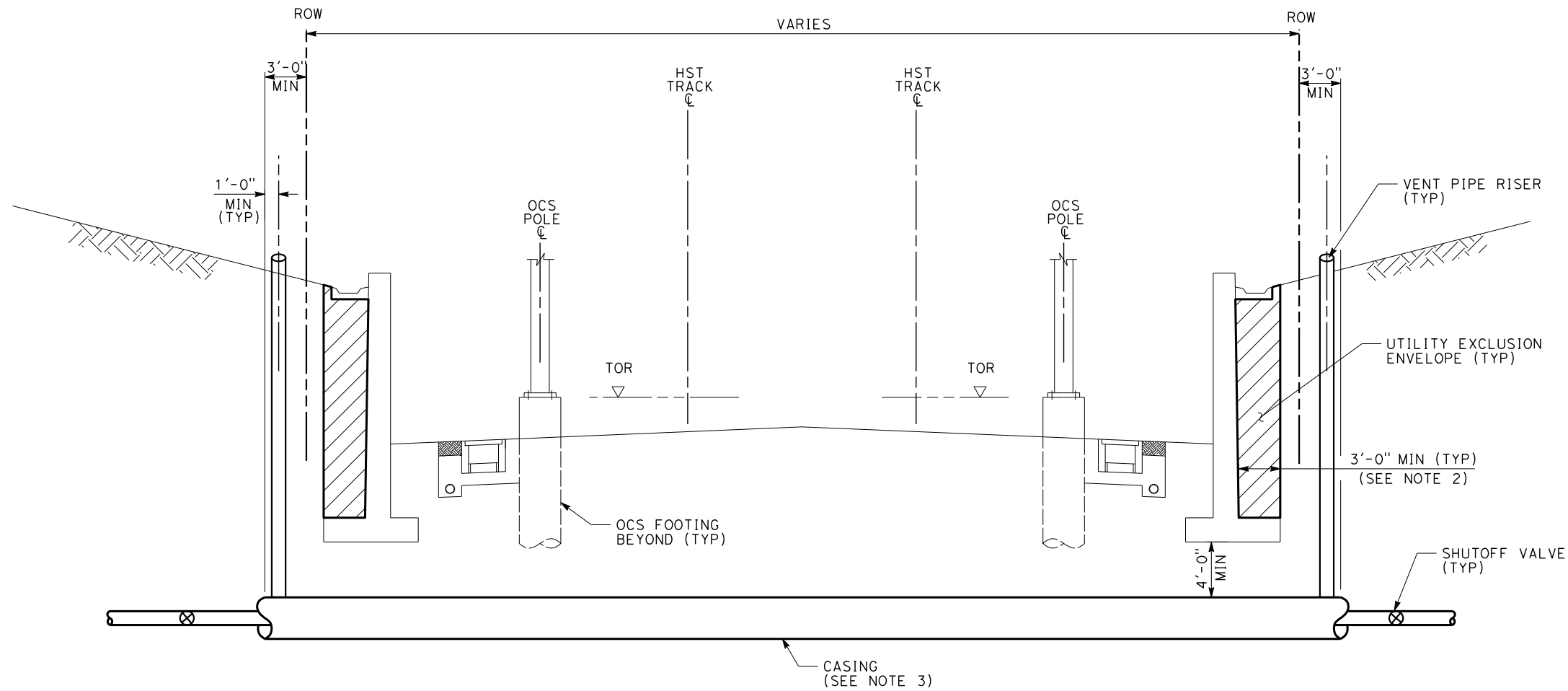
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
UTILITIES DIRECTIVE**

UTILITY CROSSING CLEARANCES  
AT GRADE

CONTRACT NO.
DRAWING NO. DD-UT-001
SCALE NO SCALE
SHEET NO.

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**NOTES:**

1. TRACK, SYSTEMS, DRAINAGE, AND STRUCTURES ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. NO UTILITIES ABOVE THE WALL FOOTINGS.
3. FOR ADDITIONAL REQUIREMENTS, SEE AREMA MANUAL.
4. TRANSVERSE UTILITIES SHALL BE LOCATED AWAY FROM MANHOLES, OCS FOOTINGS, AND OTHER HST SUBSURFACE ELEMENTS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



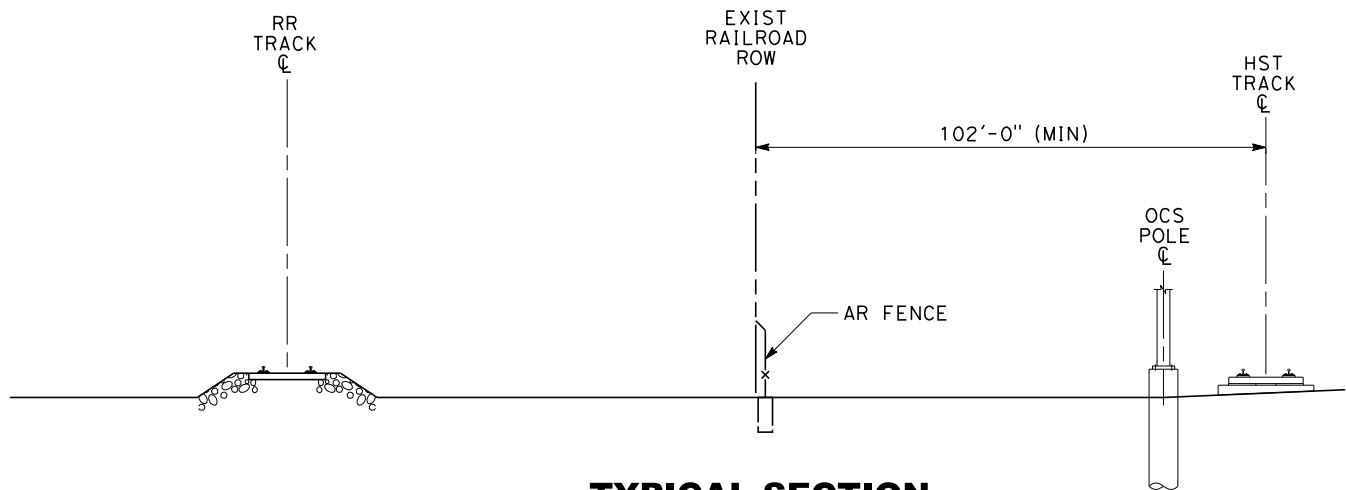
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
UTILITIES DIRECTIVE**

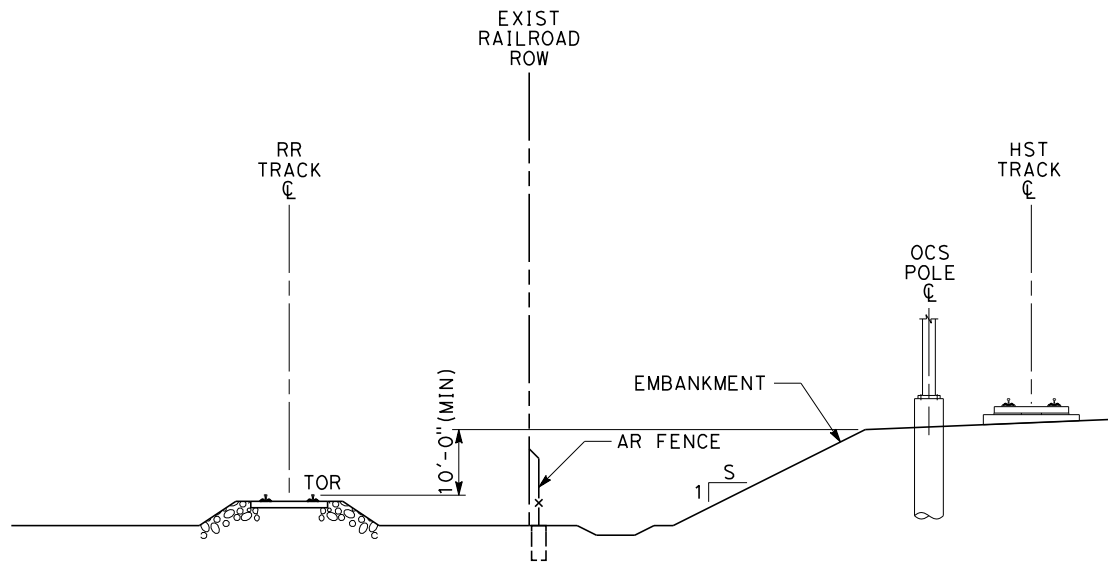
UTILITIES CROSSING CLEARANCES  
RETAINED CUT TRENCH

CONTRACT NO.
DRAWING NO. DD-UT-002
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
102' LATERAL SEPARATION  
NO INTRUSION PROTECTION REQUIRED  
(SEE NOTE 4)



**TYPICAL SECTION**  
MINIMUM 10' HIGH HST EMBANKMENT  
NO INTRUSION PROTECTION REQUIRED  
(SEE NOTE 4)

**NOTES:**

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. AR FENCE AND ITS FOUNDATION SHALL BE INSTALLED INSIDE AUTHORITY RIGHT-OF-WAY.
3. FOR COMMON EMBANKMENT FILL ONLY, USE 2:1 SIDE SLOPES.
4. SUBJECT TO FINAL APPROVAL BY CONVENTIONAL RAILROAD OPERATOR.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 08/24/2015

**PARSONS  
BRINCKERHOFF**



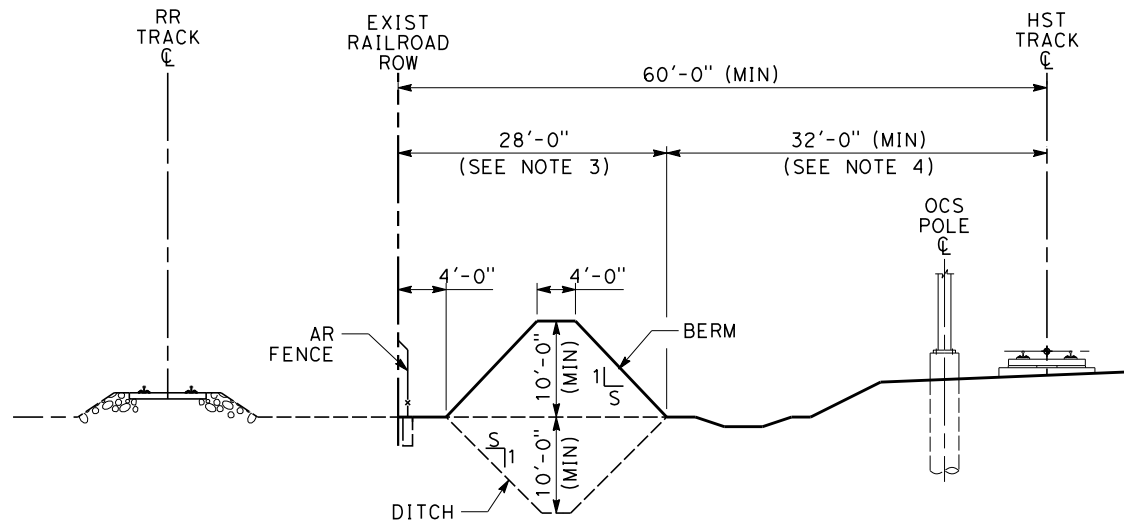
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
INTRUSION PROTECTION DIRECTIVE**

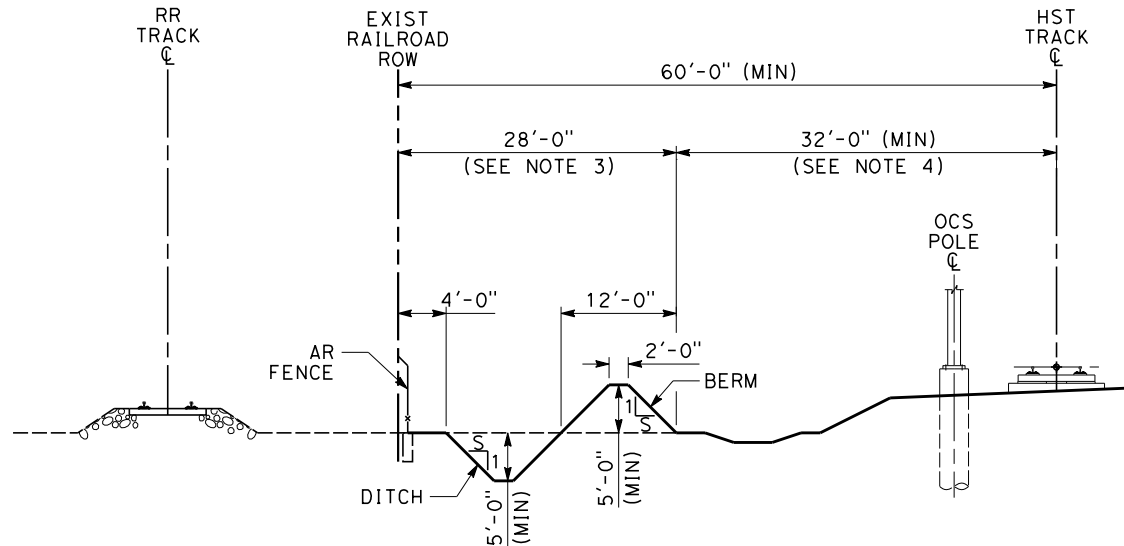
RAILROAD ADJACENT TO HST  
AT-GRADE WITHOUT INTRUSION PROTECTION

CONTRACT NO.
DRAWING NO. DD-IP-100
SCALE NO SCALE
SHEET NO.

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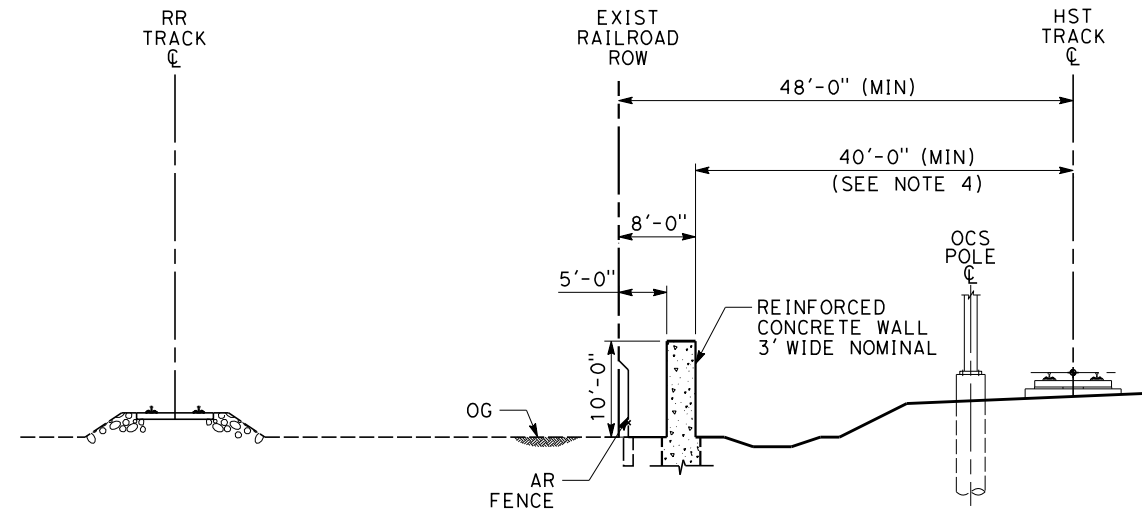
**TYPICAL SECTION**  
EARTHEN BERM OR DITCH  
(SEE NOTE 6)



**TYPICAL SECTION**  
EARTHEN BERM AND DITCH  
(SEE NOTE 6)

**NOTES:**

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SIDE SLOPES (S:1) DETERMINED THROUGH SLOPE STABILITY ANALYSIS. FOR COMMON EMBANKMENT FILL ONLY, USE 2:1 SIDE SLOPES.
3. MINIMUM DISTANCE IS BASED ON S=1.
4. MINIMUM DISTANCE CONSIDERS A MINIMUM OF 3'-6" HIGH EMBANKMENT, INCLUSIVE OF SUBBALLAST.
5. BERM MATERIAL AND COMPACTION SHALL BE SIMILAR TO EMBANKMENT.
6. SUBJECT TO FINAL APPROVAL BY CONVENTIONAL RAILROAD OPERATOR.



**TYPICAL SECTION**  
CONCRETE WALL BARRIER  
(SEE NOTE 6)

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 09/18/2015

**PARSONS  
BRINCKERHOFF**



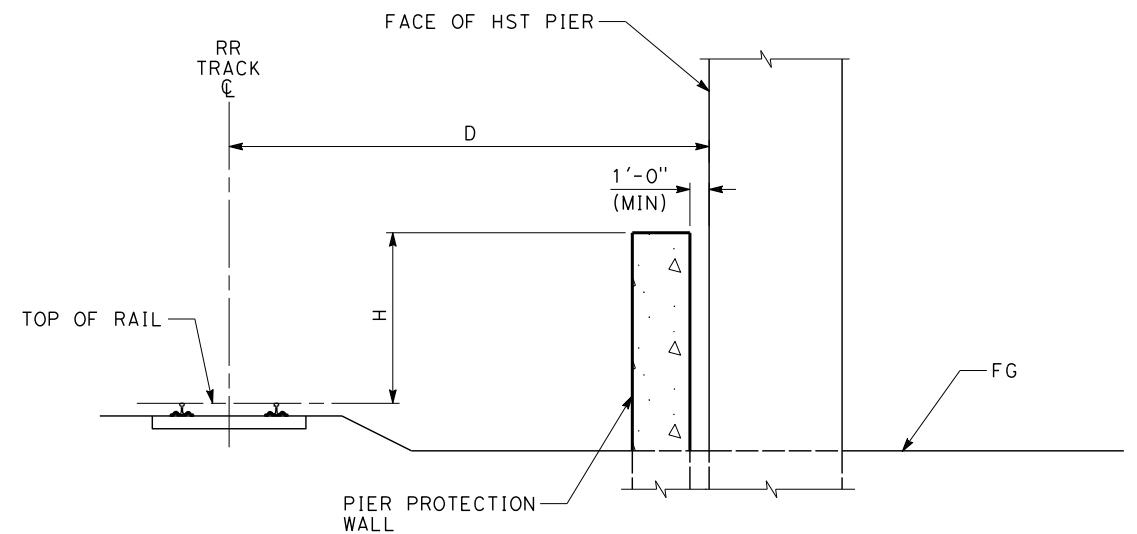
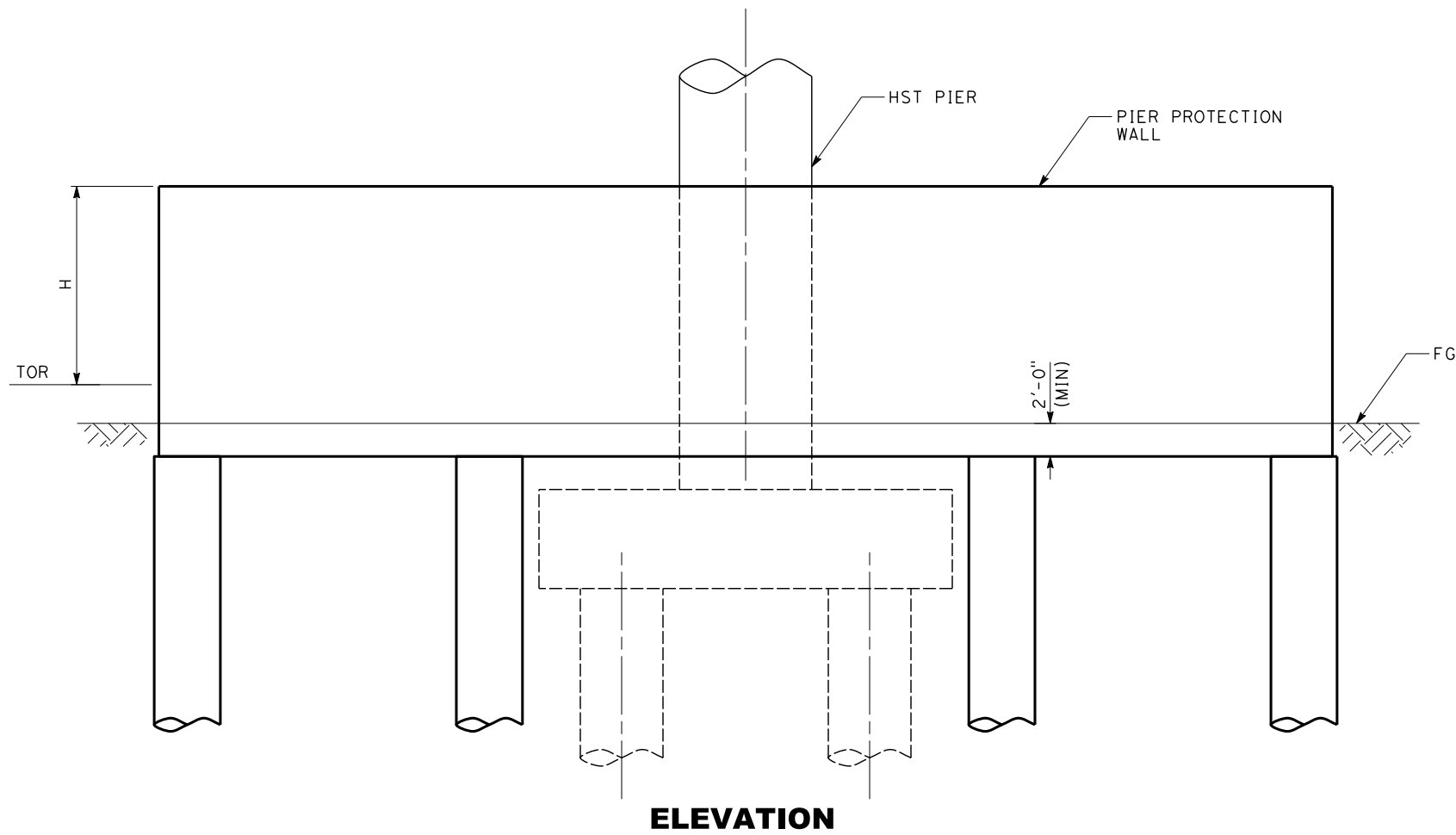
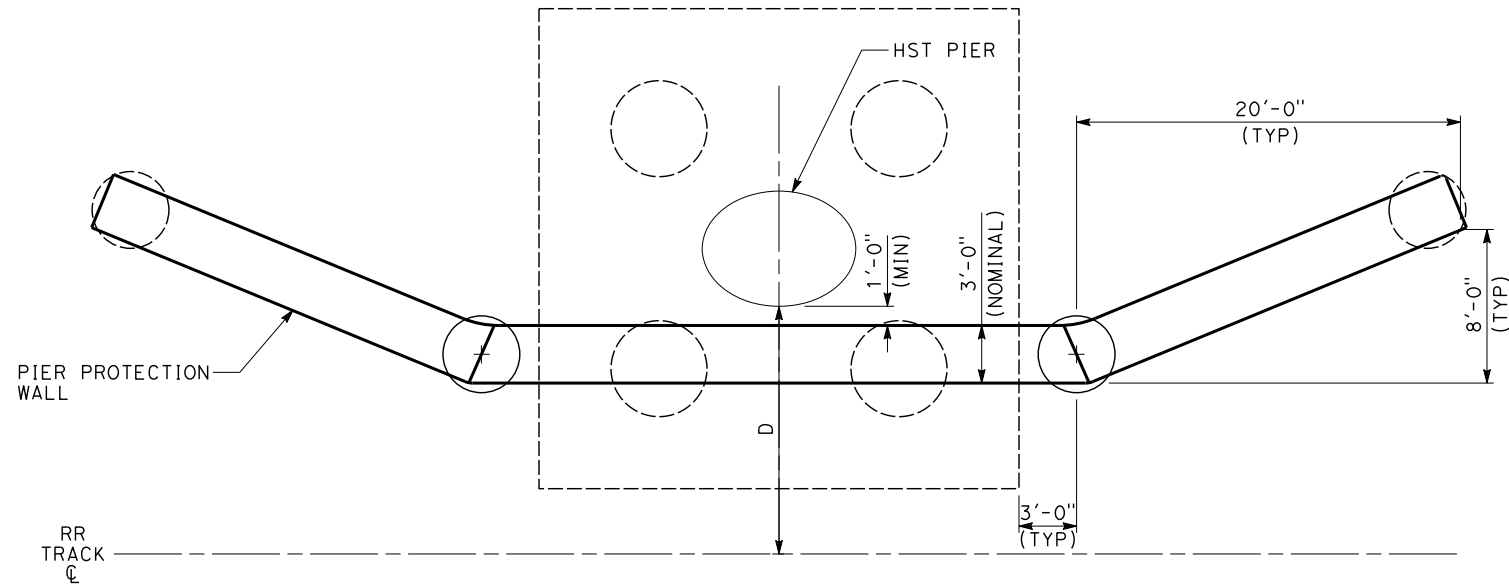
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
INTRUSION PROTECTION DIRECTIVE**

RAILROAD ADJACENT TO HST  
AT-GRADE WITH INTRUSION PROTECTION

CONTRACT NO.
DRAWING NO. DD-IP-101
SCALE NO SCALE
SHEET NO.

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### HST STRUCTURE PIER - PROTECTION WALL

CLEARANCE (D)	WALL HEIGHT ABOVE TOP OF RAIL (H)
≥ 25 FT	N/A
12 FT - 25 FT	6 FT
≤ 12 FT	12 FT

#### NOTES:

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. PIER PROTECTION WALL IS REQUIRED IF CLEARANCE FROM FACE OF HST STRUCTURE TO NEAREST RAILROAD TRACK CENTERLINE IS LESS THAN 25'-0".
3. LOCATION WHERE PIER PROTECTION WALL IS REQUIRED SHALL BE DETERMINED THROUGH SITE SPECIFIC HAZARD ANALYSES.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



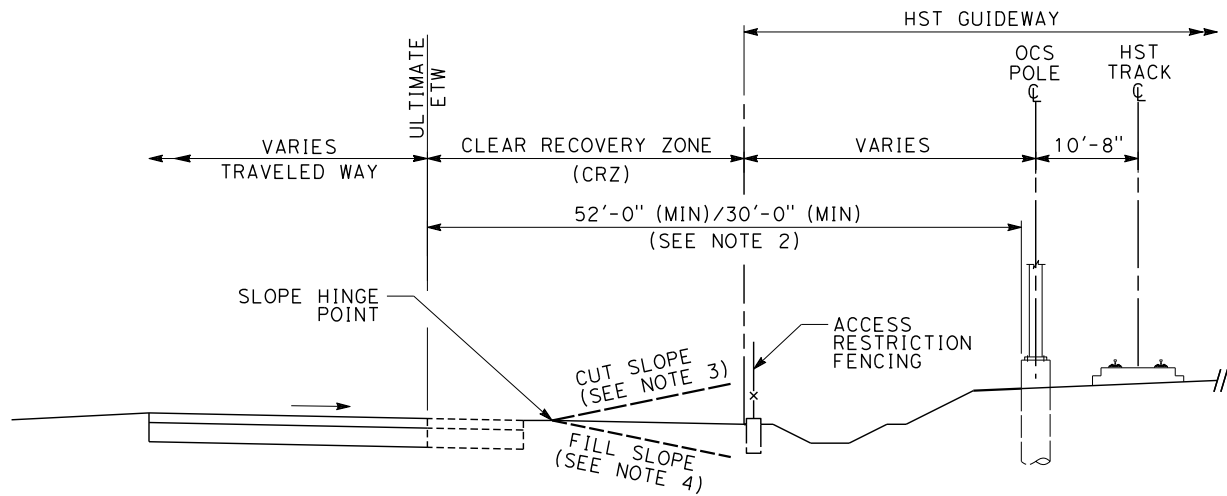
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

#### CALIFORNIA HIGH-SPEED TRAIN PROJECT INTRUSION PROTECTION DIRECTIVE

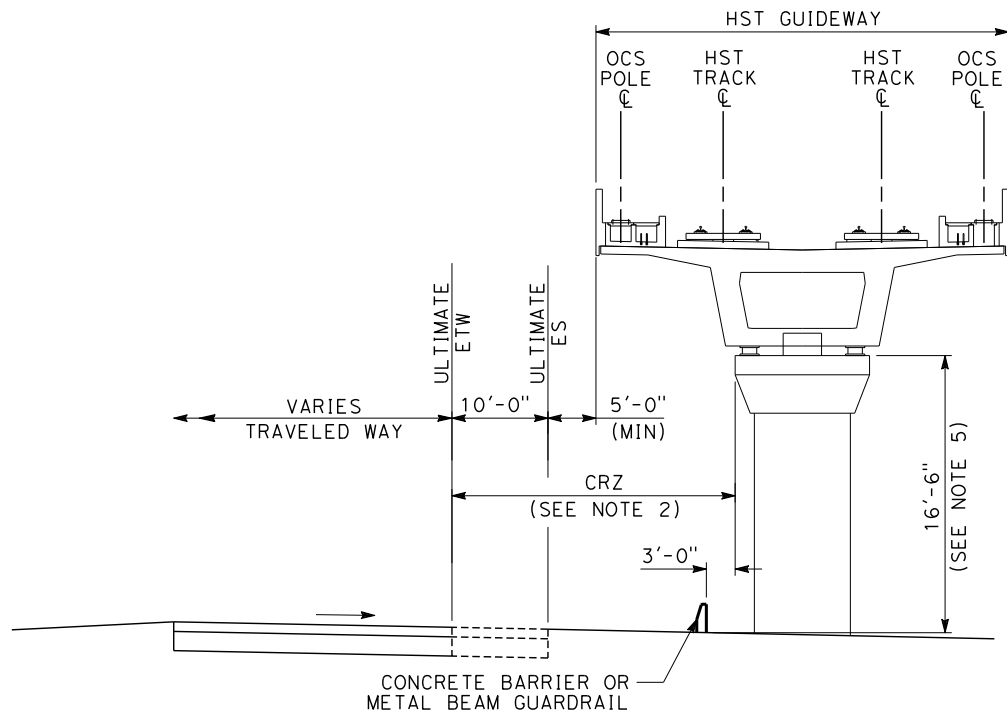
HST PIER PROTECTION  
IN RAILROAD RIGHT OF WAY

CONTRACT NO.
DRAWING NO. DD-IP-102
SCALE NO SCALE
SHEET NO.

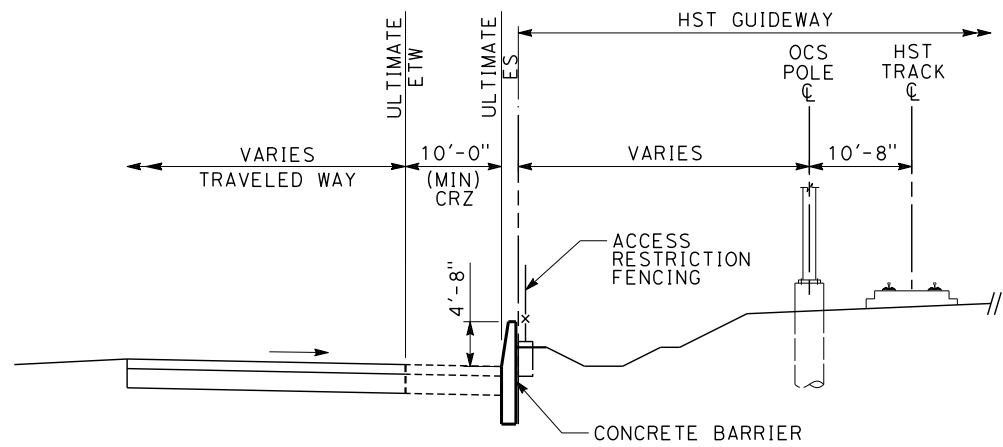
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### HST AT GRADE ADJACENT TO HIGHWAY/ROADWAY



### HST AERIAL STRUCTURE ADJACENT TO HIGHWAY/ROADWAY



### HST AT GRADE ADJACENT TO HIGHWAY/ROADWAY WITH 10 FEET CLEAR RECOVERY ZONE (CRZ)

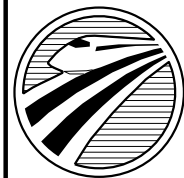
#### NOTES:

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. WHEN HST CORRIDOR IS CONSTRUCTED LONGITUDINALLY TO A FREEWAY, EXPRESSWAY, OR HIGHWAY, METAL BEAM GUARDRAIL OR CONCRETE BARRIER SHALL BE REQUIRED AT HST FIXED OBJECT IF THE DISTANCE FROM ULTIMATE ETW TO HST AERIAL STRUCTURE COLUMN, OR ANY HST FIXED OBJECT IS LESS THAN 52'-0". IF HST CORRIDOR IS NOT LONGITUDINAL TO A FREEWAY, EXPRESSWAY, OR HIGHWAY, THE CLEARANCE REQUIREMENT TO A HST FIXED OBJECT IS 30'-0".
3. IF HEIGHT DIFFERENTIAL AT ROADWAY CUT SLOPE HINGE POINT AND HST ROW FENCE IS GREATER THAN 7'-0", NO GUARDRAIL OR CONCRETE BARRIER IS REQUIRED.
4. IF THE HEIGHT DIFFERENTIAL AT ROADWAY FILL HINGE POINT AND HST ROW FENCE IS GREATER THAN 10'-0", GUARDRAIL WILL BE REQUIRED AT ROADWAY FILL HINGE POINT.
5. IF THE VERTICAL CLEARANCE BETWEEN THE RECOVERY AREA AND THE HST STRUCTURE BENT CAP IS LESS THAN 16'-6", METAL BEAM GUARDRAIL OR CONCRETE BARRIER WILL BE REQUIRED 3'-0" FROM EDGE OF HST BENT CAP.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY <b>A. ABTAHI</b>
DRAWN BY <b>V. HUANTE</b>
CHECKED BY <b>H. NGUYEN</b>
IN CHARGE <b>G. LUSHEROVICH</b>
DATE <b>01/24/2014</b>

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

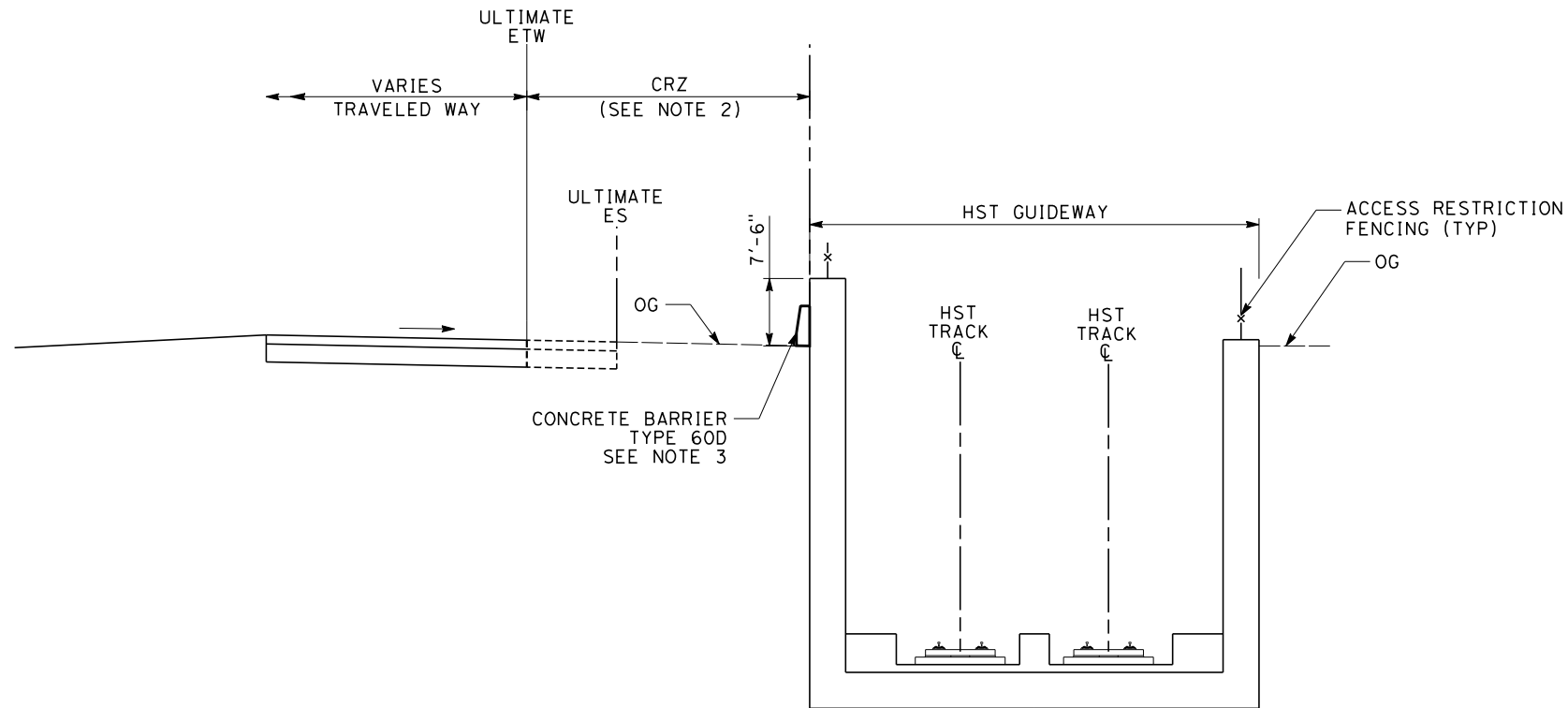
#### CALIFORNIA HIGH-SPEED TRAIN PROJECT INTRUSION PROTECTION DIRECTIVE

HST ADJACENT TO HIGHWAY/ROADWAY

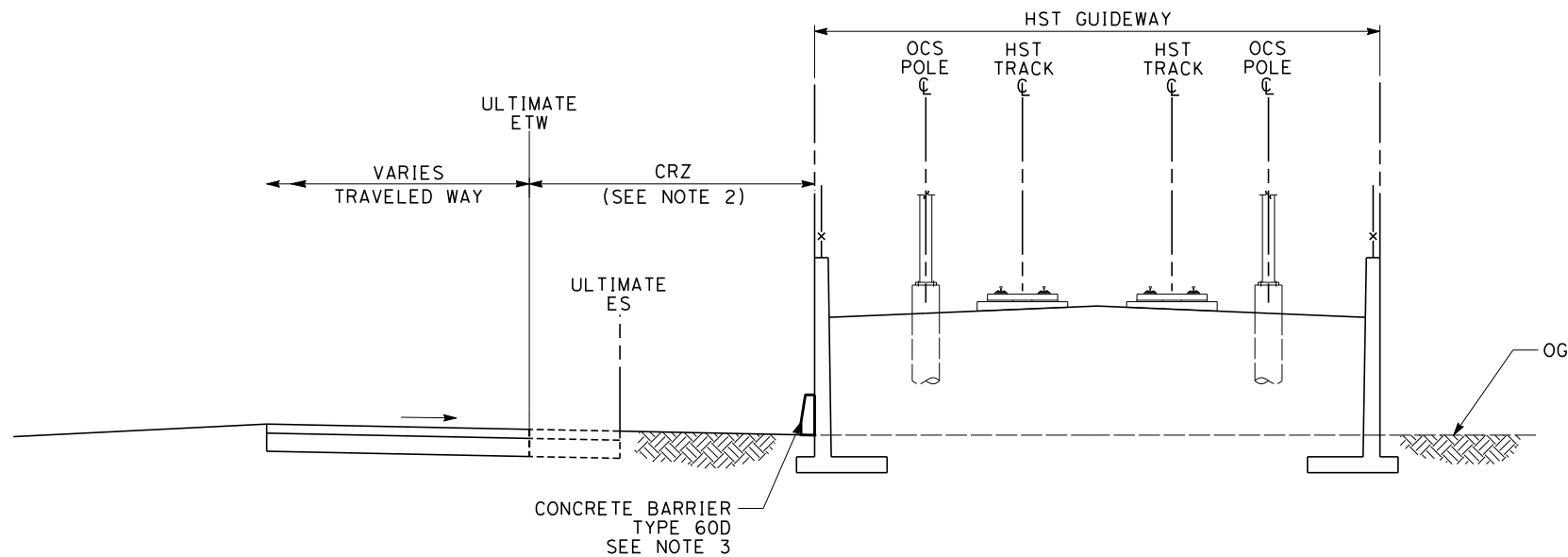
CONTRACT NO.
DRAWING NO. DD-IP-103
SCALE NO SCALE
SHEET NO.



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HIGHWAY/ROADWAY AT GRADE ADJACENT TO HST TRENCH



HIGHWAY/ROADWAY AT GRADE ADJACENT TO HST RETAINED FILL

NOTES:

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. IF THE DISTANCE BETWEEN HST WALL AND THE ULTIMATE ETW IS LESS THAN 52'-0", THE WALL HEIGHT SHALL BE 7'-6" ABOVE THE GROUND SURFACE AND CALTRANS CONCRETE BARRIER TYPE 60D SHALL BE INCLUDED IN CONSTRUCTION OF THE WALL.
3. FOR CONCRETE BARRIER TYPE AND THE END TREATMENT OF THE CONCRETE BARRIER REFER TO CHAPTER 7 OF CALTRANS TRAFFIC MANUAL AND CALTRANS STANDARD PLANS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY A. ABTAHI
DRAWN BY V. HUANTE
CHECKED BY H. NGUYEN
IN CHARGE G. LUSHEROVICH
DATE 08/29/2014

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
INTRUSION PROTECTION DIRECTIVE

HST TRENCH AND RETAINING WALL PROTECTION

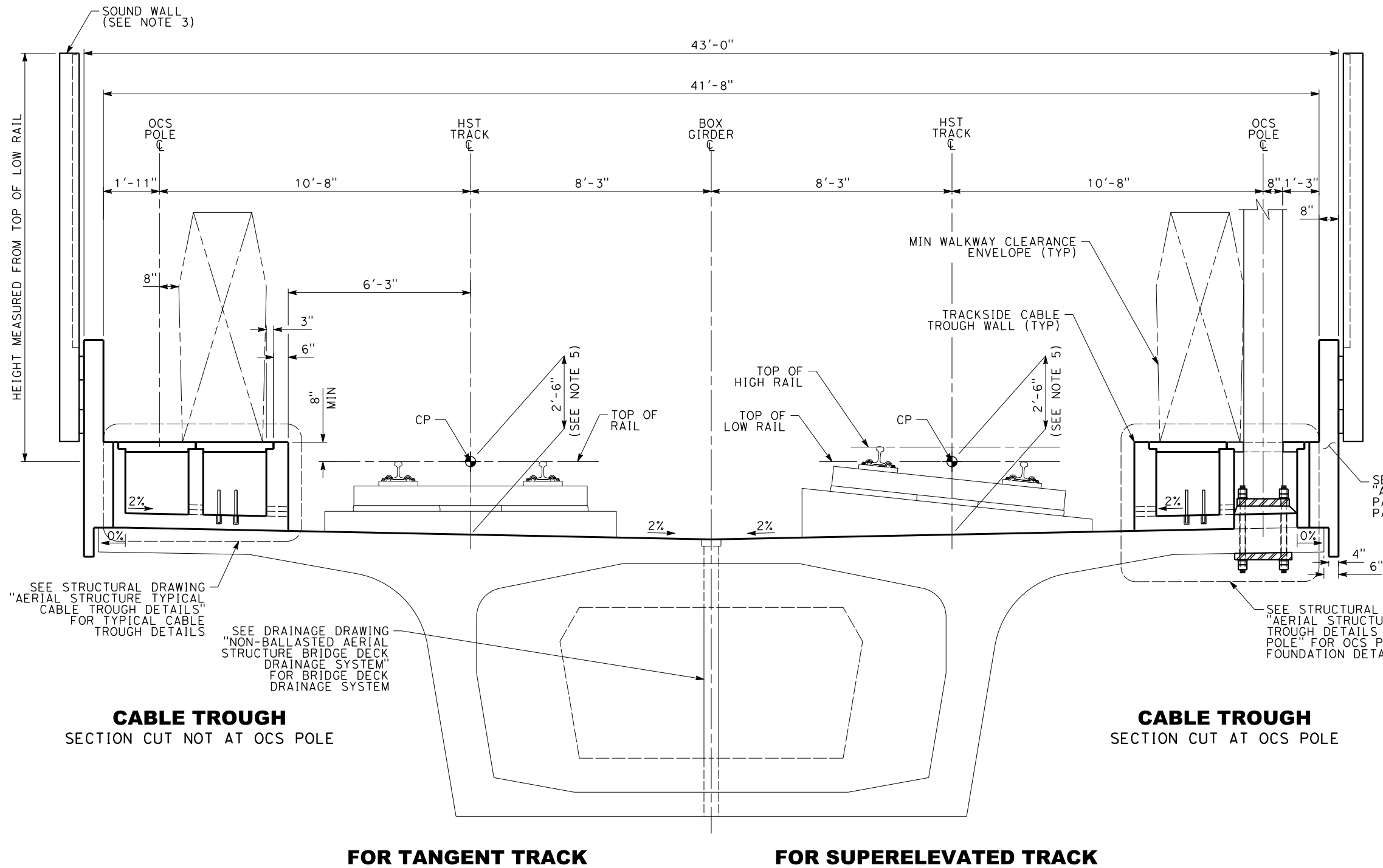
CONTRACT NO.
DRAWING NO. DD-IP-104
SCALE NO SCALE
SHEET NO.

1. METAL BEAM GUARDRAIL OR CONCRETE BARRIER SHALL BE REQUIRED AT HST FIXED OBJECT IF THE DISTANCE FROM ULTIMATE ETW TO HST FIXED OBJECT IS LESS THAN 30'-0". REFER TO CHAPTER 7 OF CALTRANS TRAFFIC MANUAL AND CALTRANS STANDARD PLANS.

[illegible]

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

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**NOTES:**

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. ON CURVED ALIGNMENT, THE RELATIVE DIMENSIONS BETWEEN BRIDGE DECK AND BOX GIRDER SHALL BE ADJUSTED PROPERLY. IF A STRAIGHT DECK EDGE IS SELECTED, THE WIDER DECK WIDTH MAY BE REQUIRED.
3. THE HEIGHT OF SOUND WALLS SHALL BE AS DEFINED IN THE TABLE 12-1 OF THE DESIGN CRITERIA. THE STRUCTURE AND CONNECTION BETWEEN PARAPET AND STRUCTURE DECK SHALL BE DESIGNED TO RESIST THE LOAD COMBINATIONS AS DESCRIBED IN TABLE 12-4 OF THE DESIGN CRITERIA TO ACCOMMODATE INSTALLATION OF SOUND WALLS. NO LONGITUDINAL GAPS SHALL BE PERMITTED BETWEEN THE BOTTOM OF SOUND WALL AND THE PARAPET OR DECK, NOR ANY VERTICAL GAPS BETWEEN ADJACENT SOUND WALL PANELS.
4. THE DIRECT FIXATION RAIL SYSTEM AND THE TRACK SLAB SHOWN ARE FOR ILLUSTRATION ONLY. THE CONTRACTOR SHALL DESIGN AND INSTALL SHEAR REINFORCEMENTS OR CONNECTORS, WHICH ARE CAPABLE OF TRANSFERRING THE TRACTION OR BRAKING FORCES AS DESCRIBED IN THE STRUCTURES CHAPTER OF THE DESIGN CRITERIA, IN THE STRUCTURAL DECK BELOW THE TRACK SLAB IN ACCORDANCE WITH THE PROVISIONS PROVIDED BY THE TRACK WORK DESIGNER THROUGH SYSTEM INTERFACE WORKSHOP MEETINGS. THE TOP SURFACE OF STRUCTURAL DECK BELOW THE TRACK SLAB SHALL BE PROPERLY ROUGHENED BY THE CONTRACTOR. SHEAR REINFORCEMENTS OR CONNECTORS SHALL BE HOT-DIP GALVANIZED. THE DESIGN AND INSTALLATION OF SHEAR REINFORCEMENTS OR CONNECTORS SHALL BE CONSIDERED AS PART OF THE CONTRACTOR'S SCOPE OF WORK.
5. FOR BALLASTED STRUCTURES, THE DESIGN DEPTH FROM TOP OF RAIL TO THE STRUCTURE DECK OR INVERT SHALL BE SET EQUAL TO 2'-9" PLUS ALLOWANCE FOR WATER PROOFING MEMBRANE AND PROTECTION LAYER.

REF No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 07/18/2014

**PARSONS  
BRINCKERHOFF**





**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT**  
**STRUCTURAL DIRECTIVE**  
TYPICAL CROSS SECTION  
AERIAL STRUCTURE  
TWO TRACK NON-BALLASTED  
TYPICAL CONFIGURATION ON TOP OF DECK

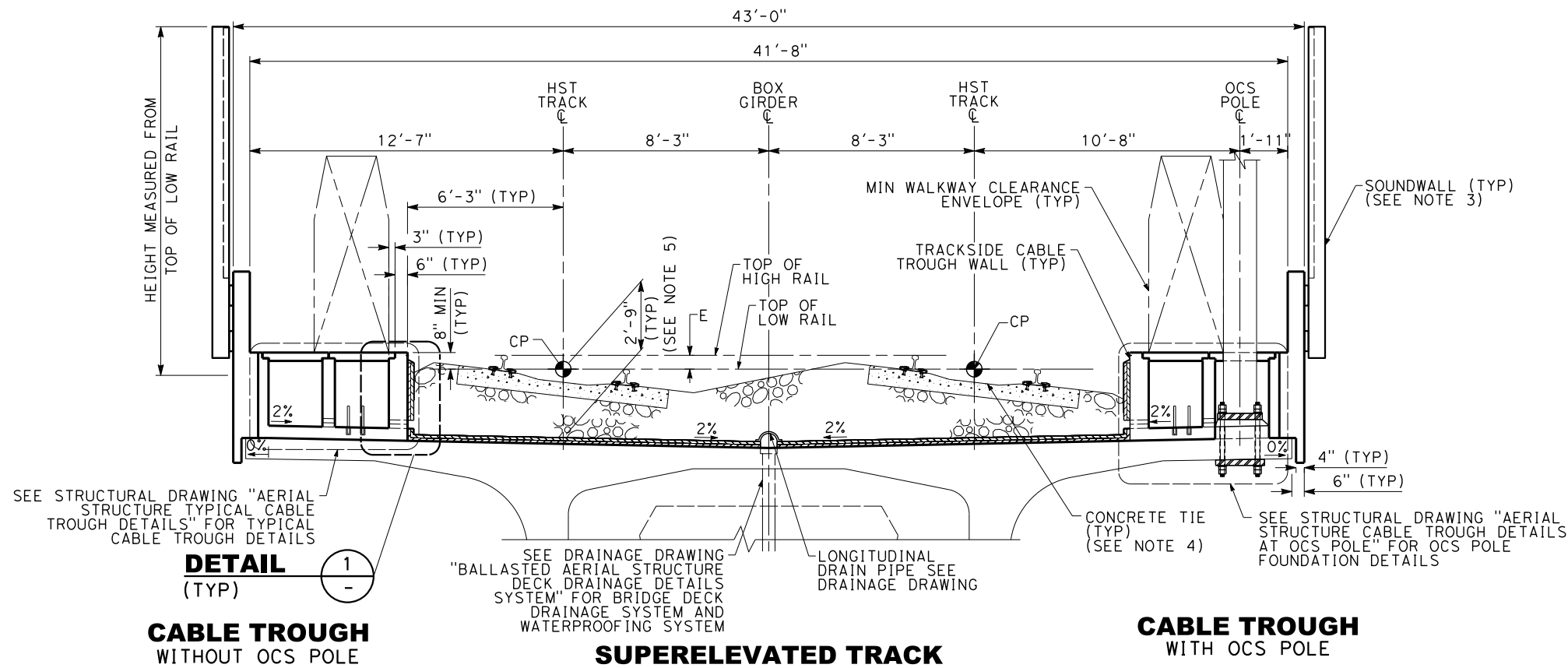
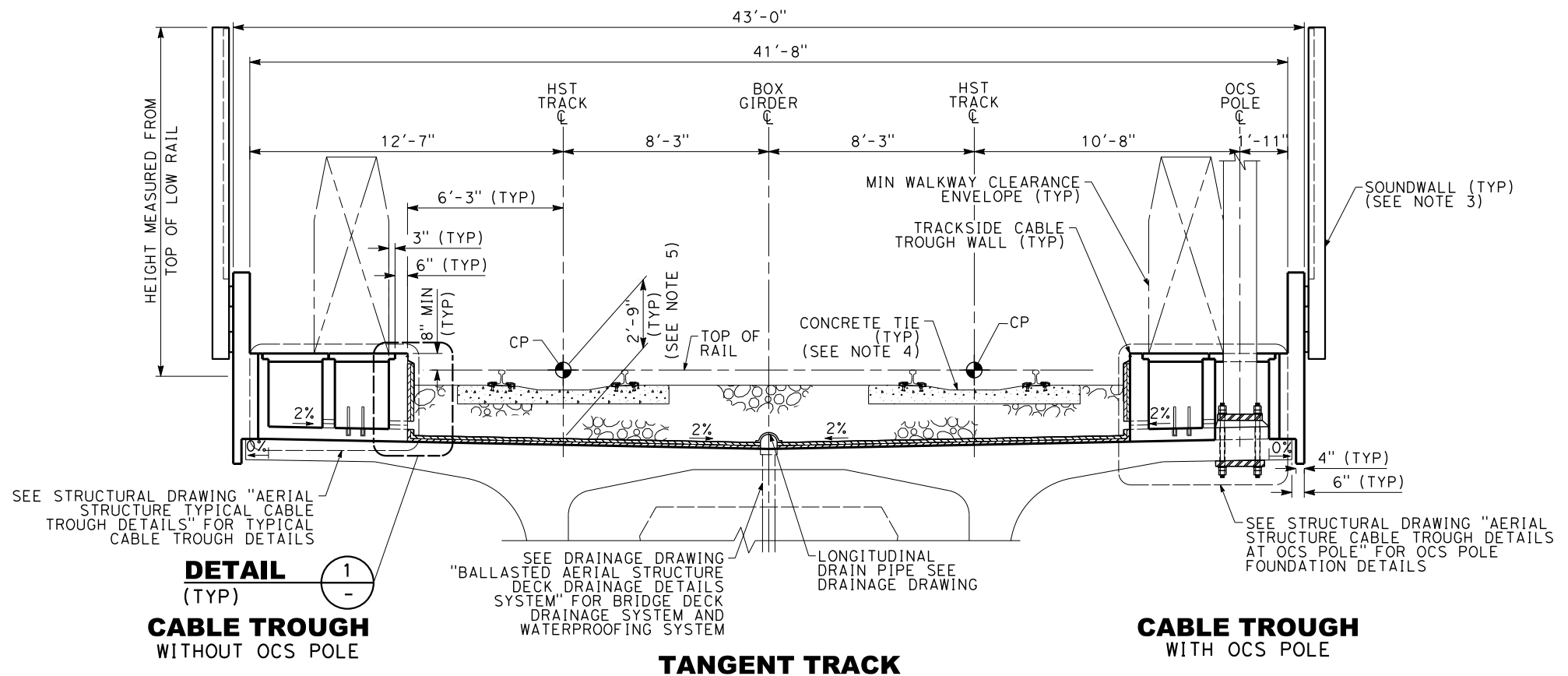
CONTRACT NO.
DRAWING NO. DD-ST-100
SCALE AS SHOWN
SHEET NO.



1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. ON CURVED ALIGNMENT, THE RELATIVE DIMENSIONS BETWEEN BRIDGE DECK AND BOX GIRDER SHALL BE ADJUSTED PROPERLY. IF A STRAIGHT DECK EDGE IS SELECTED, THE WIDER DECK WIDTH MAY BE REQUIRED.
3. THE HEIGHT OF SOUND WALLS SHALL BE AS DEFINED IN THE TABLE 12-1 OF THE DESIGN CRITERIA. THE STRUCTURE AND CONNECTION BETWEEN PARAPET AND STRUCTURE DECK SHALL BE DESIGNED TO RESIST THE LOAD COMBINATIONS AS DESCRIBED IN TABLE 12-4 OF THE DESIGN CRITERIA TO ACCOMMODATE INSTALLATION OF SOUND WALLS. NO LONGITUDINAL GAPS SHALL BE PERMITTED BETWEEN THE BOTTOM OF SOUND WALL AND THE PARAPET OR DECK, NOR ANY VERTICAL GAPS BETWEEN ADJACENT SOUND WALL PANELS.
4. THE DIRECT FIXATION RAIL SYSTEM AND THE TRACK SLAB SHOWN ARE FOR ILLUSTRATION ONLY. THE CONTRACTOR SHALL DESIGN AND INSTALL SHEAR REINFORCEMENTS OR CONNECTORS, WHICH ARE CAPABLE OF TRANSFERRING THE TRACTION OR BRAKING FORCES AS DESCRIBED IN THE STRUCTURES CHAPTER OF THE DESIGN CRITERIA, IN THE STRUCTURAL DECK BELOW THE TRACK SLAB IN ACCORDANCE WITH THE PROVISIONS PROVIDED BY THE TRACK WORK DESIGNER THROUGH SYSTEM INTERFACE WORKSHOP MEETINGS. THE TOP SURFACE OF STRUCTURAL DECK BELOW THE TRACK SLAB SHALL BE PROPERLY ROUGHENED BY THE CONTRACTOR. SHEAR REINFORCEMENTS OR CONNECTORS SHALL BE HOT-DIP GALVANIZED. THE DESIGN AND INSTALLATION OF SHEAR REINFORCEMENTS OR CONNECTORS SHALL BE CONSIDERED AS PART OF THE CONTRACTOR'S SCOPE OF WORK.
5. FOR BALLASTED STRUCTURES, THE DESIGN DEPTH FROM TOP OF RAIL TO THE STRUCTURE DECK OR INVERT SHALL BE SET EQUAL TO 2'-9" PLUS ALLOWANCE FOR WATER PROOFING MEMBRANE AND PROTECTION LAYER.

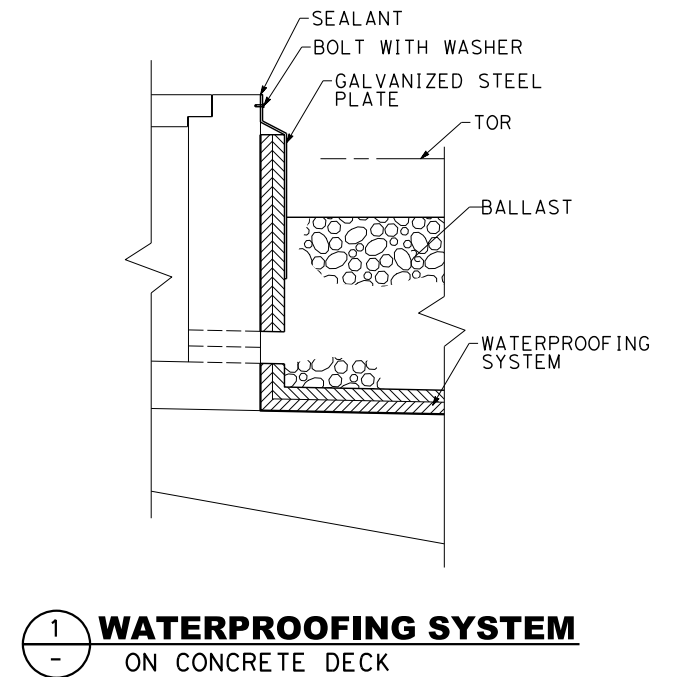
							DESIGNED BY P. LIN	<div></div>	<b>CALIFORNIA HIGH-SPEED TRAIN PROJECT STRUCTURAL DIRECTIVE</b>		CONTRACT NO.
							DRAWN BY V. HUANTE		DRAWING NO. DD-ST-101		
							CHECKED BY K. PUGASAP		SCALE AS SHOWN		
							IN CHARGE G. LUSHEROVICH		SHEET NO.		
							DATE 07/18/2014				
REV	DATE	BY	CHK	APP	DESCRIPTION						

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**NOTES:**

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. ON CURVED ALIGNMENT, THE RELATIVE DIMENSIONS BETWEEN BRIDGE DECK AND BOX GIRDER SHALL BE ADJUSTED PROPERLY. IF A STRAIGHT DECK EDGE IS SELECTED, THE WIDER DECK WIDTH MAY BE REQUIRED.
3. THE HEIGHT OF SOUND WALLS SHALL BE AS DEFINED IN THE TABLE 12-1 OF THE DESIGN CRITERIA. THE STRUCTURE AND CONNECTION BETWEEN PARAPET AND STRUCTURE DECK SHALL BE DESIGNED TO RESIST THE LOAD COMBINATIONS AS DESCRIBED IN TABLE 12-4 OF THE DESIGN CRITERIA TO ACCOMMODATE INSTALLATION OF SOUND WALLS. NO LONGITUDINAL GAPS SHALL BE PERMITTED BETWEEN THE BOTTOM OF SOUND WALL AND THE PARAPET OR DECK, NOR ANY VERTICAL GAPS BETWEEN ADJACENT SOUND WALL PANELS.
4. CONCRETE TIES SHOWN ARE FOR ILLUSTRATION ONLY.
5. FOR BALLASTED STRUCTURES, THE DESIGN DEPTH FROM TOP OF RAIL TO THE STRUCTURE DECK OR INVERT SHALL BE SET EQUAL TO 2'-9" PLUS ALLOWANCE FOR WATER PROOFING MEMBRANE AND PROTECTION LAYER.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY G. HARRIS
IN CHARGE G. LUSHEROVICH
DATE 07/18/2014

**PARSONS  
BRINCKERHOFF**

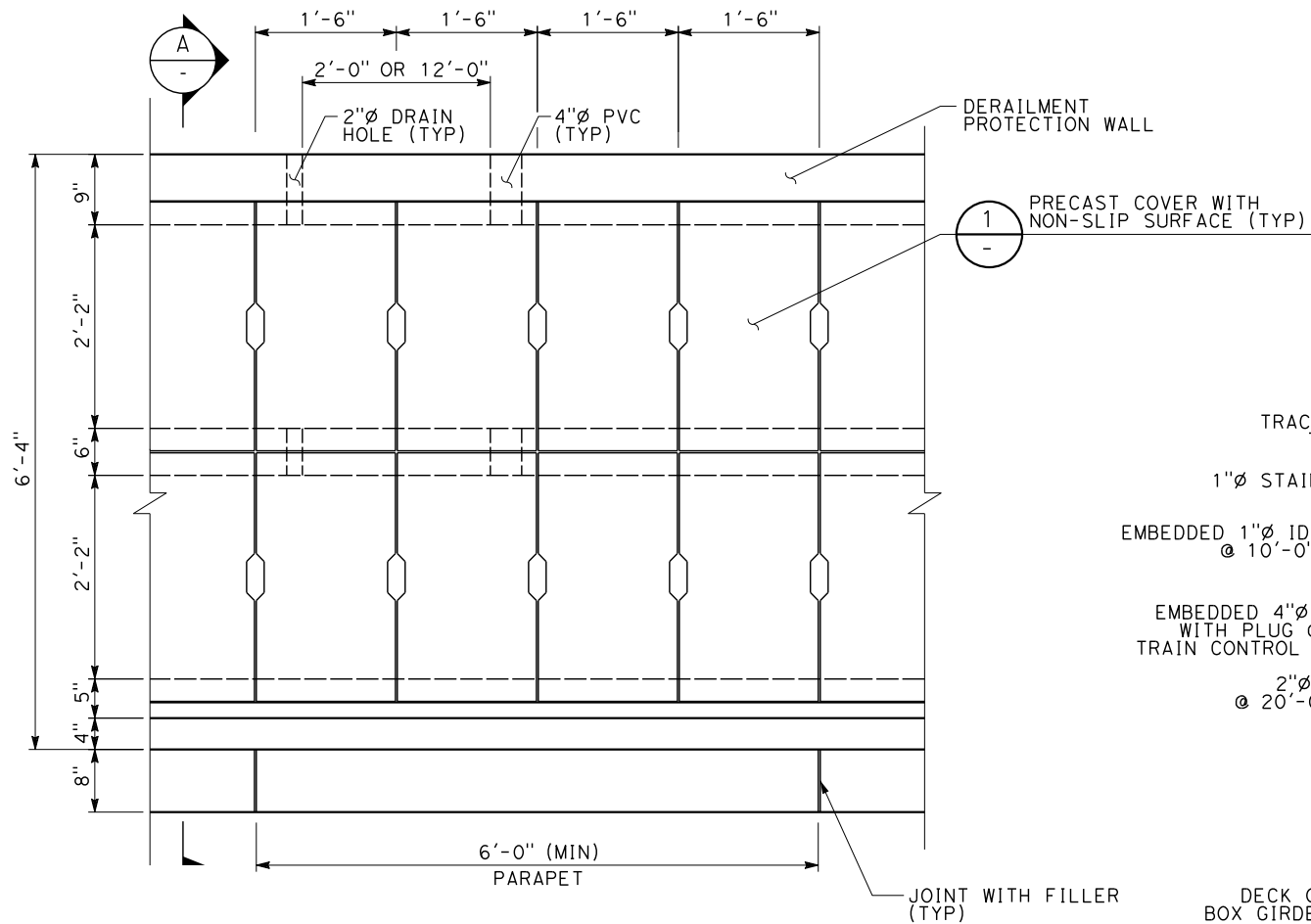


**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

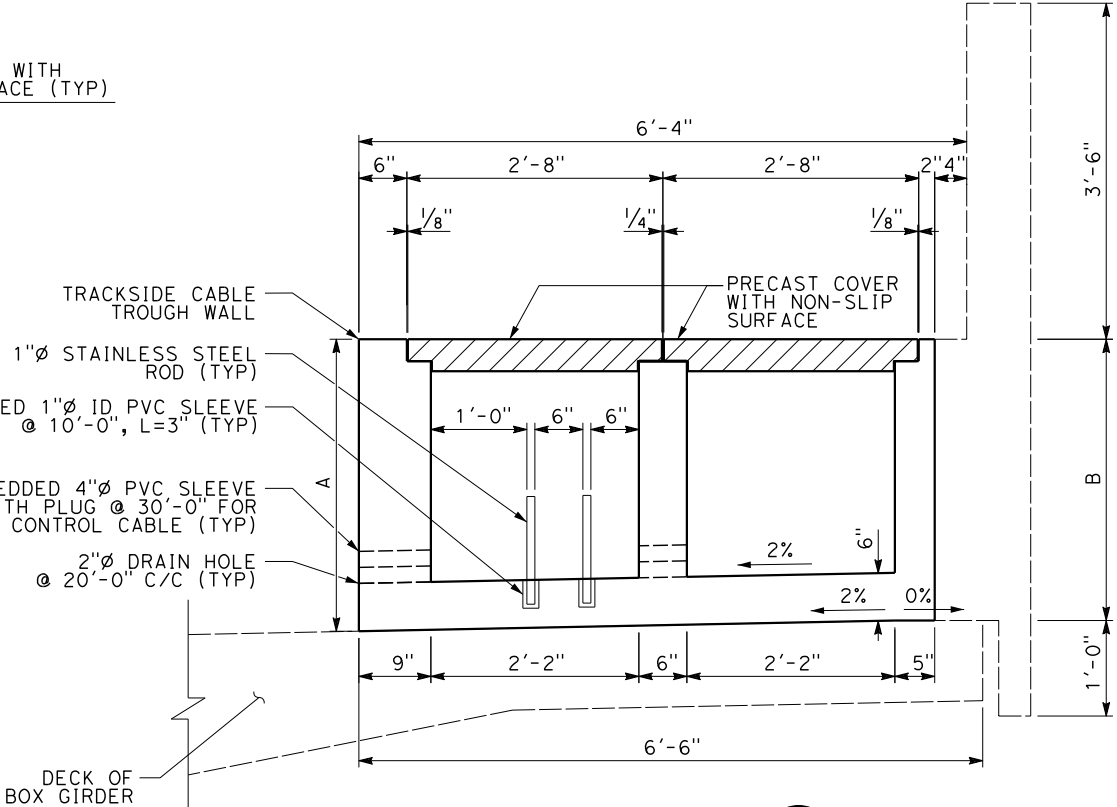
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**  
TYPICAL CROSS SECTION  
AERIAL STRUCTURE  
TWO TRACK BALLASTED  
TYPICAL CONFIGURATION ON TOP OF DECK

CONTRACT NO.
DRAWING NO. DD-ST-102
SCALE NO SCALE
SHEET NO.

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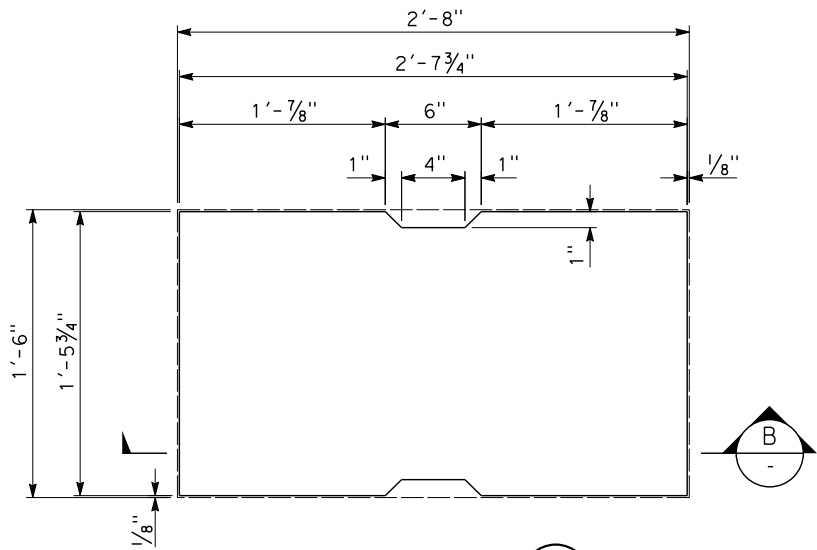
**CABLE TROUGH PLAN**  
SCALE: 1"=1'-0"



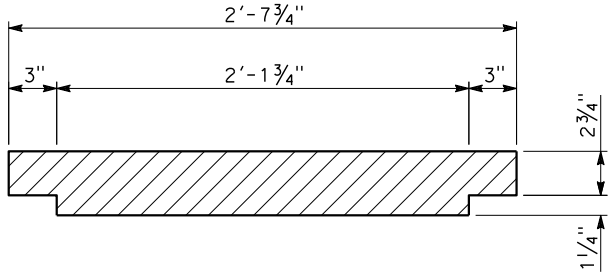
**SECTION A-A**  
SCALE: 1"=1'-0"

	NON-BALLASTED TRACK		BALLASTED TRACK	
	TWO TRACK	ONE TRACK	TWO TRACK	ONE TRACK
A	3'-1/2"	3'-3 3/16"	3'-3 1/2" + T*	3'-6 3/16" + T*
B	2'-11 1/8"	3'-2 1/4"	2'-2 1/8" + T*	3'-5 1/4" + T*

T\* = SUM OF WATERPROOFING MEMBRANE THICKNESS AND PROTECTION LAYER THICKNESS



**DETAIL 1**  
SCALE: 1/2"=1'-0"



**SECTION B-B**  
SCALE: 1/2"=1'-0"

- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. THE CABLE TROUGH DETAIL IS FOR STANDARD TWO TRACK. FOR CABLE TROUGH INFORMATION IN SPECIAL TRACK AREA, THE CONTRACTOR SHALL COORDINATE WITH THE INTERFACED TRACK WORK DESIGNER FOR DETAILED INFORMATION.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



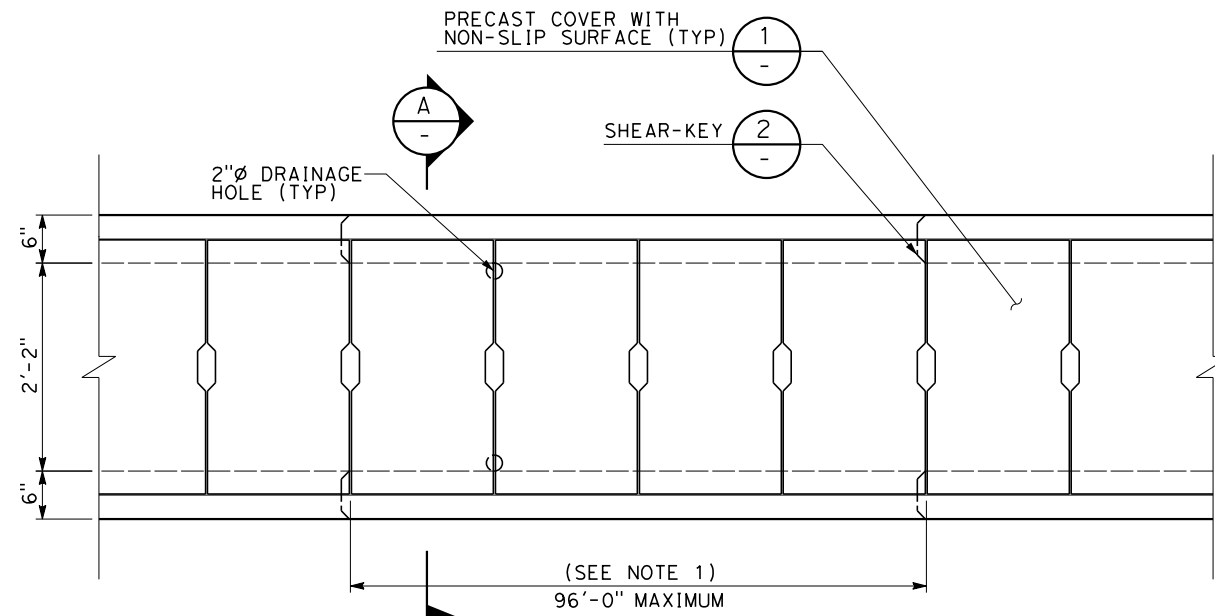
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

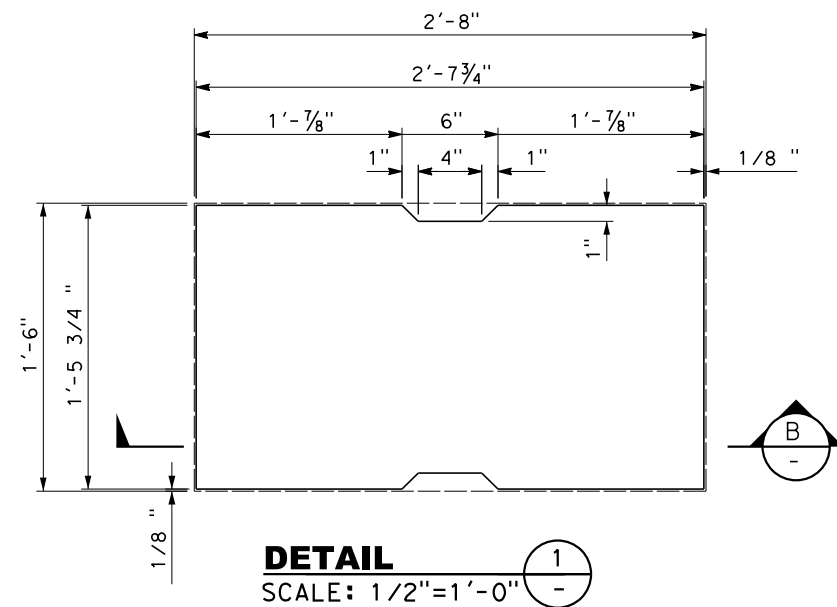
AERIAL STRUCTURE  
TYPICAL CABLE TROUGH DETAILS

CONTRACT NO.
DRAWING NO. DD-ST-900
SCALE AS SHOWN
SHEET NO.

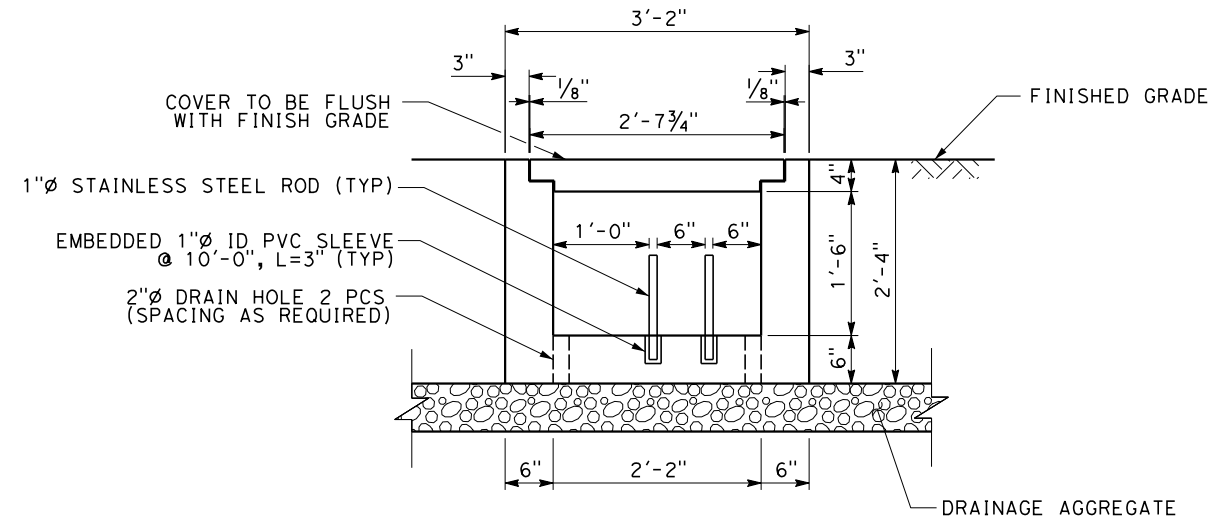
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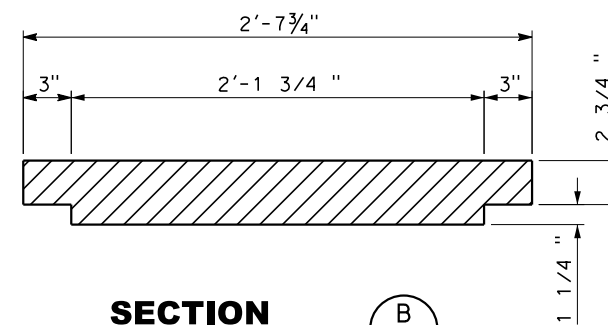
**PRECAST CABLE TROUGH PLAN**  
SCALE: 1"=1'-0"



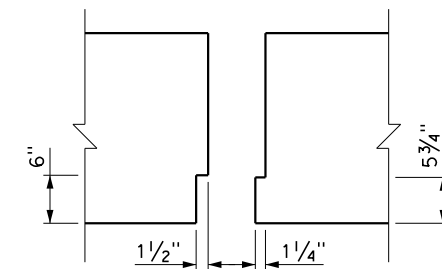
**DETAIL 1**  
SCALE: 1/2"=1'-0"



**SECTION A-A**  
SCALE: 1"=1'-0"



**SECTION B-B**  
SCALE: 1/2"=1'-0"



**DETAIL 2**  
SCALE: 1"=1'-0"

**NOTES:**

1. CONTRACTOR SHALL DETERMINE WORK SEGMENT LENGTH BASED ON CONSTRUCTION METHOD.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY B. VALENTI
DRAWN BY V. LAVERDE
CHECKED BY P. LIN
IN CHARGE G. LUSHEROVICH
DATE 08/29/2014

**PARSONS  
BRINCKERHOFF**



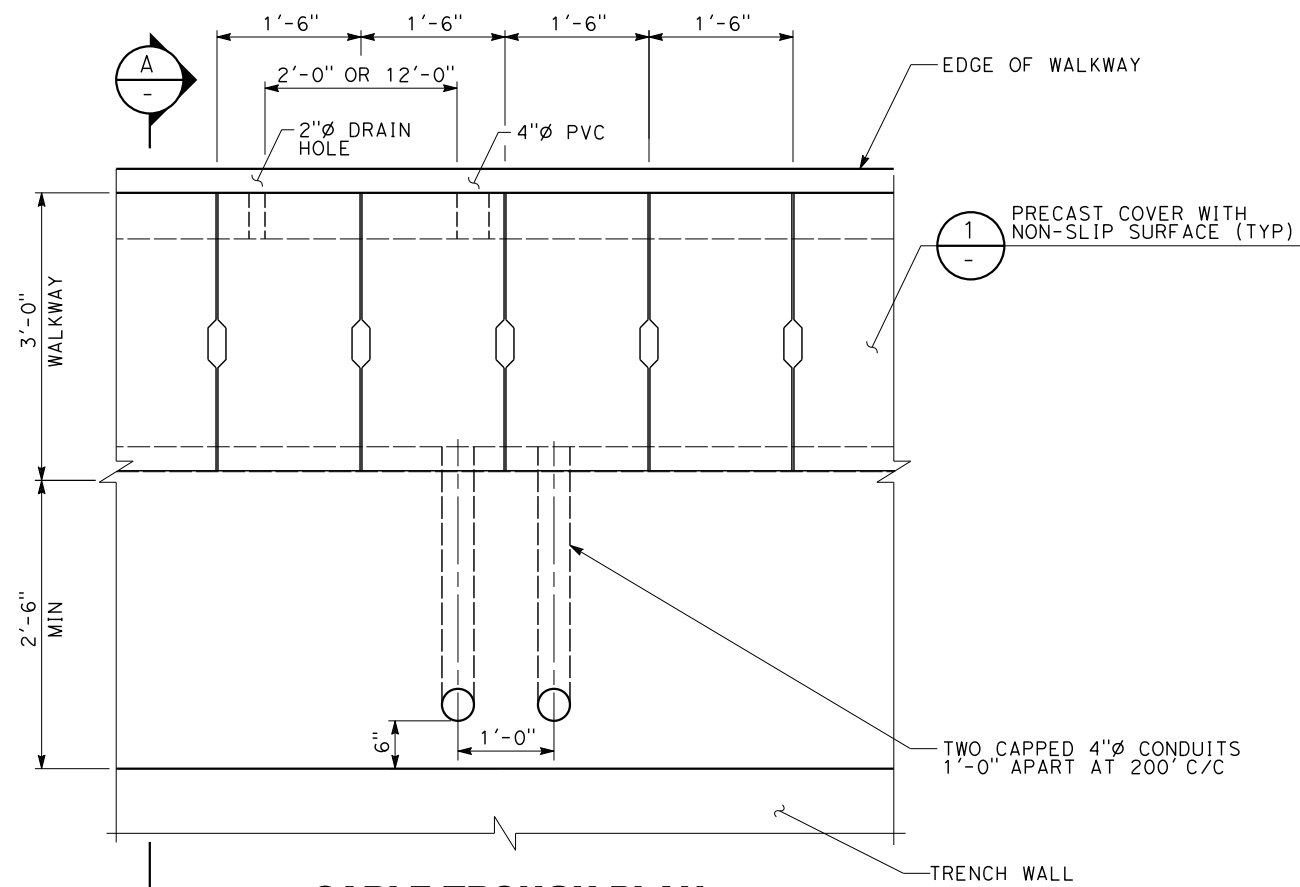
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

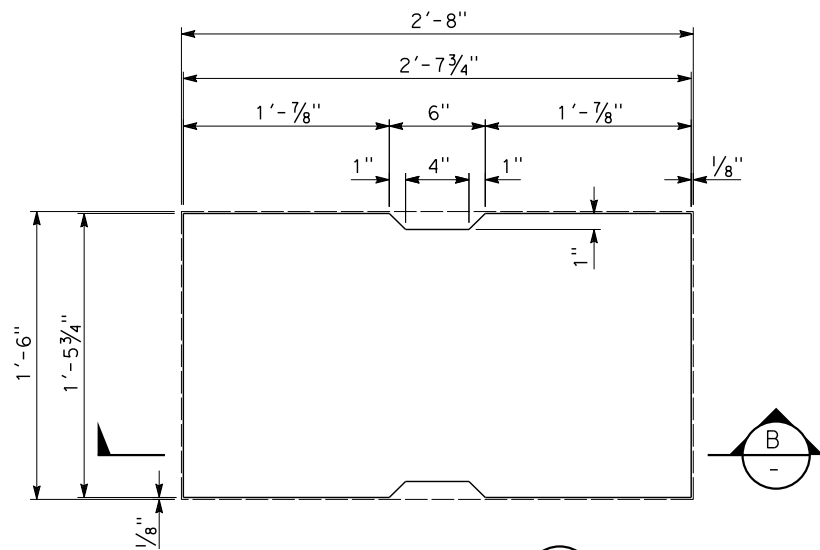
TYPICAL CABLE TROUGH DETAILS  
EMBANKMENT/CUT

CONTRACT NO.
DRAWING NO. DD-ST-901
SCALE AS SHOWN
SHEET NO.

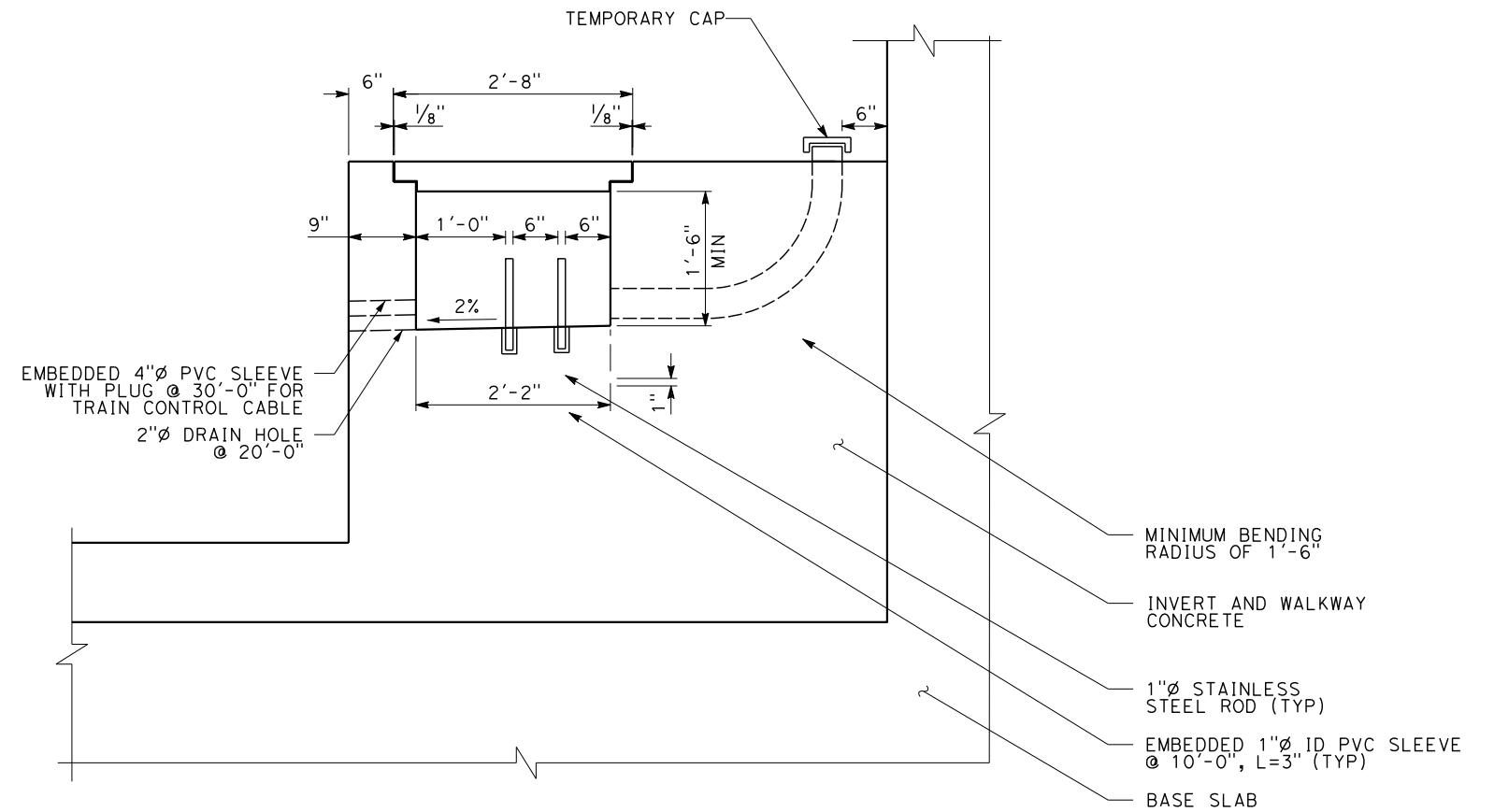
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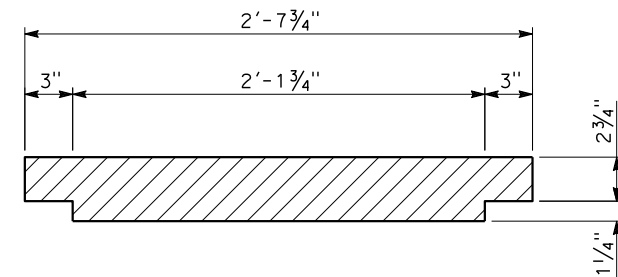
**CABLE TROUGH PLAN AND CONDUIT DETAIL**  
SCALE: 1"=1'-0"



**DETAIL**  
SCALE: 1/2"=1'-0" 1  
-



**SECTION**  
SCALE: 1"=1'-0" A  
-



**SECTION**  
SCALE: 1/2"=1'-0" B  
-

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY B. VALENTI
DRAWN BY V. HUANTE
CHECKED BY P. LIN
IN CHARGE J. CHIRCO
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

CABLE TROUGH DETAILS  
TRENCH/CUT AND COVER TUNNEL

CONTRACT NO.
DRAWING NO. DD-ST-902
SCALE AS SHOWN
SHEET NO.

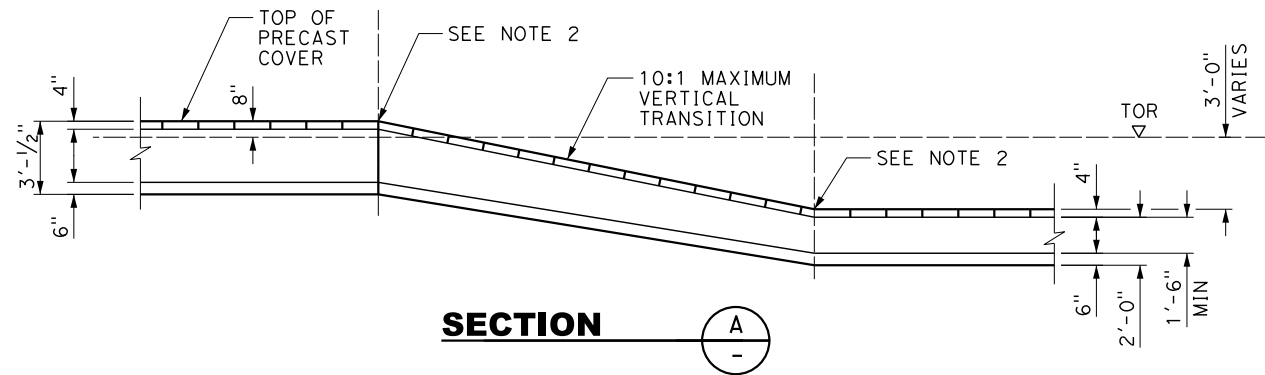
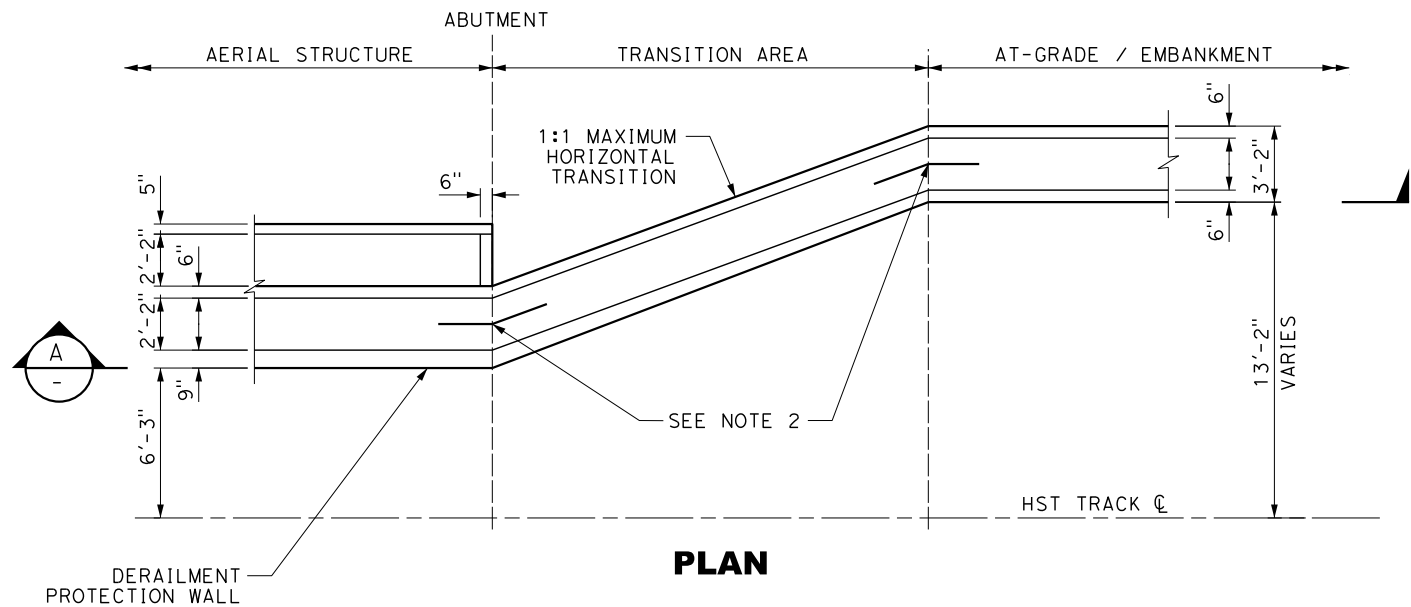




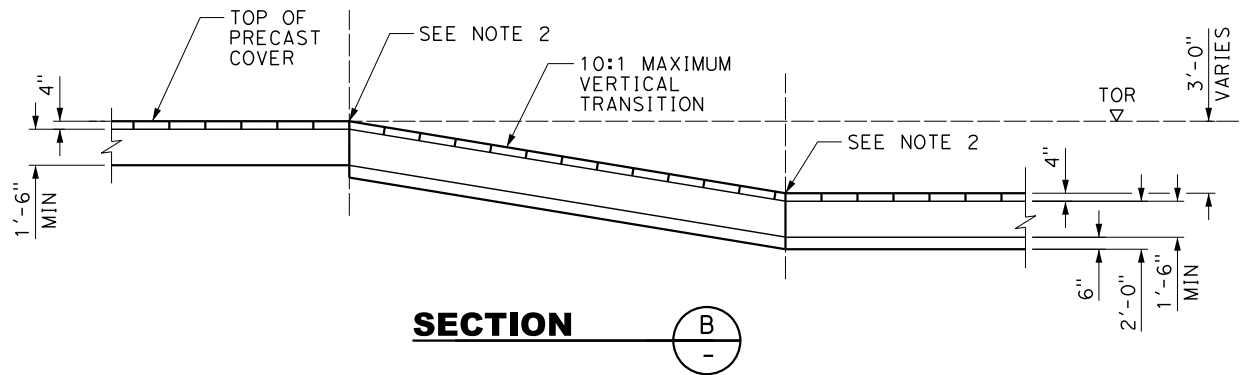
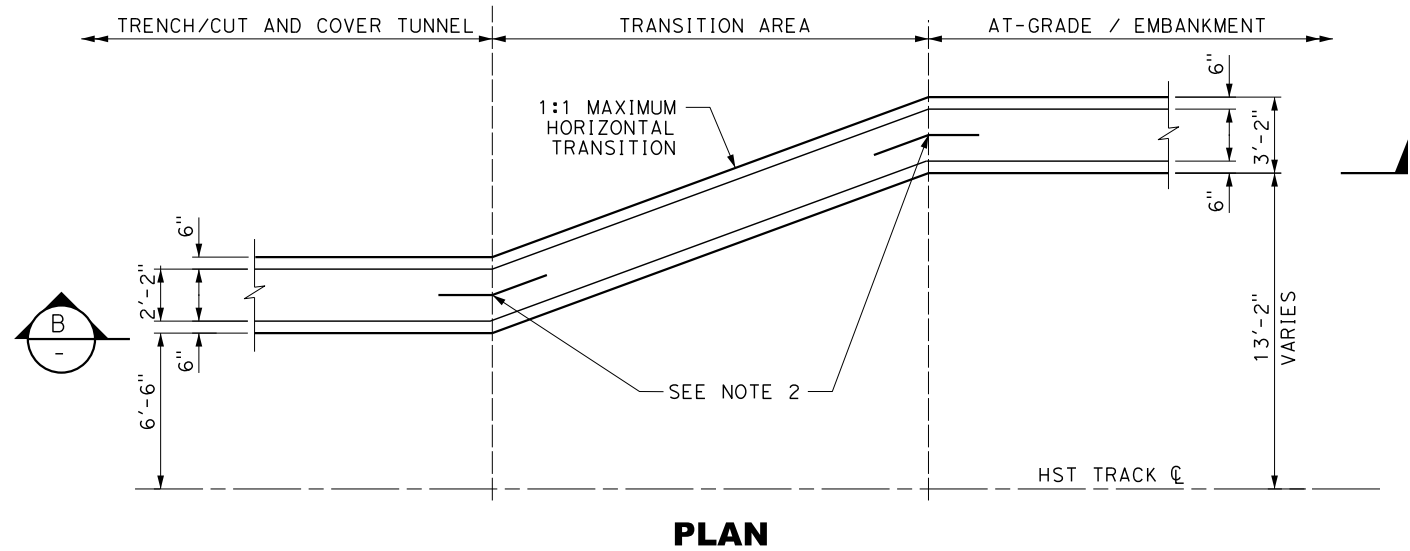
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. FOR PRECAST COVER DETAIL, SEE DRAWING "AERIAL STRUCTURE TYPICAL CABLE TROUGH DETAILS".
3. SEE STRUCTURAL DRAWING "AERIAL STRUCTURE TYPICAL CABLE TROUGH DETAILS" FOR DIMENSIONS NOT SHOWN.
4. OCS POLE, ANCHOR BOLT ASSEMBLIES, BASE PLATES, AND GROUT PAD FOR OCS POLE FOUNDATION ARE SHOWN FOR ILLUSTRATION ONLY. THE LOCATION OF EMBEDDED PVC SLEEVES AND LOADS FOR DESIGN OF OCS POLE FOUNDATION SHALL CONFORM TO THE REQUIREMENTS IN THE STRUCTURAL CHAPTER OF THE DESIGN CRITERIA.

CONTRACT NO.
DRAWING NO. DD-ST-903
SCALE AS SHOWN
SHEET NO.

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AERIAL STRUCTURE TO AT-GRADE/EMBANKMENT



TRENCH/CUT AND COVER TUNNEL TO AT-GRADE/EMBANKMENT

- NOTES:
- BOTH HORIZONTAL AND VERTICAL TRANSITION OF THE CABLE TROUGH SHALL OCCUR WITHIN THE LONGITUDINAL STRUCTURAL TRANSITION ZONE.
  - SPECIAL TRANSITION TROUGH AND COVER WILL BE REQUIRED AT ANGLE POINTS. MAXIMIZE EXTENT OF STANDARD PIECES.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY B. VALENTI
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

PARSONS  
BRINCKERHOFF



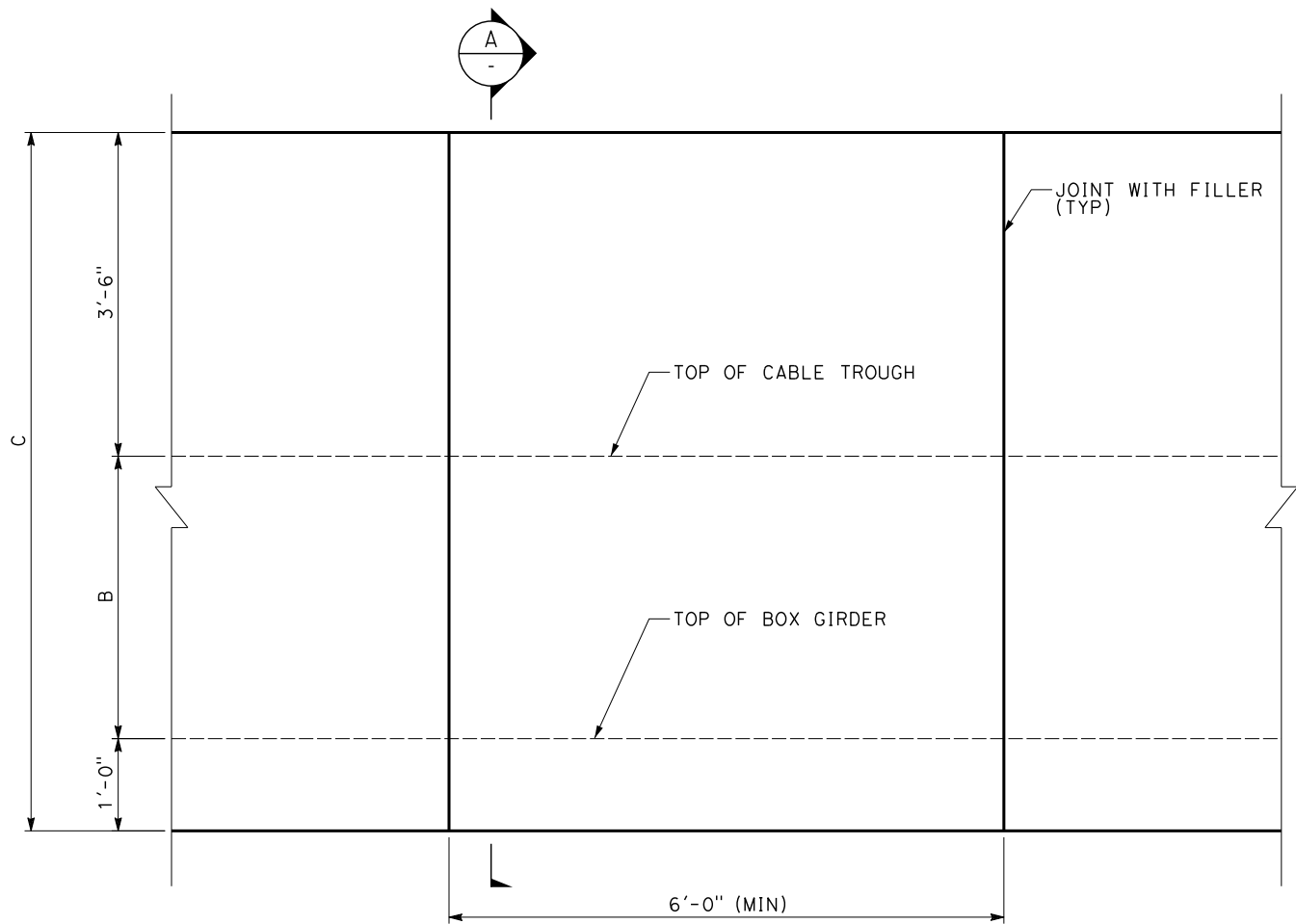
CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE

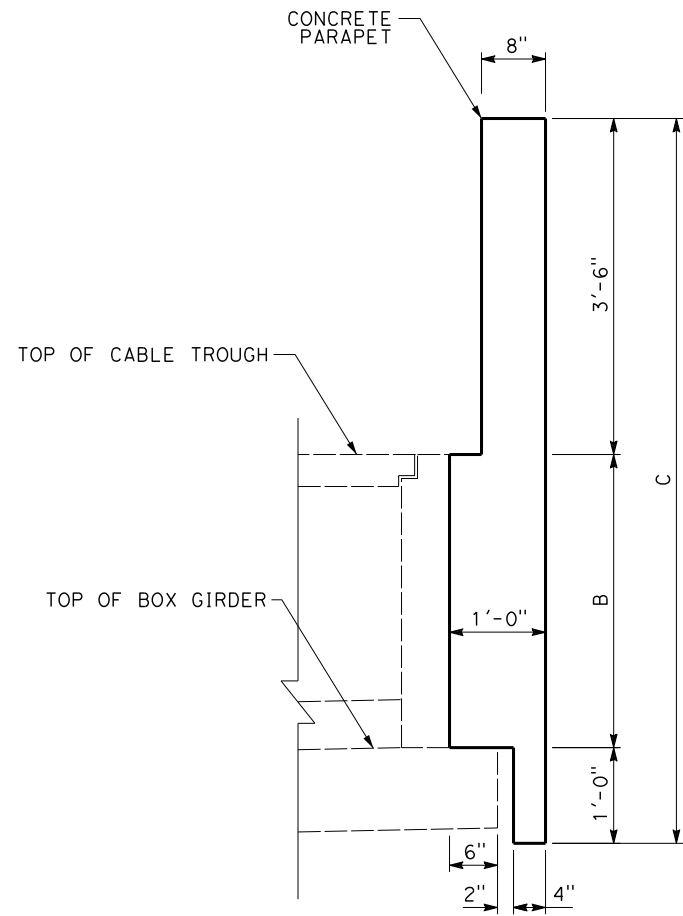
CABLE TROUGH LAYOUT TRANSITION AREAS

CONTRACT NO.
DRAWING NO. DD-ST-904
SCALE AS SHOWN
SHEET NO.

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CONCRETE PARAPET  
ELEVATION VIEW



SECTION

- NOTES:**
1. PARAPETS SHALL BE PROVIDED ALONG EDGES OF AERIAL STRUCTURES, BRIDGES, AND HST GRADE SEPARATIONS.
  2. PARAPETS SHALL BE DESIGNED FOR WIND LOADS, SLIPSTREAM EFFECTS, AND OTHER LOADS REQUIRED IN THE STRUCTURES CHAPTER OF THE DESIGN CRITERIA.
  3. PARAPETS SHALL BE DESIGNED TO ACCOMMODATE FUTURE INSTALLATION OF SOUND WALLS.
  4. AT CONSTRUCTION JOINTS OF CONCRETE PARAPETS, A JOINT WITH FILLER SHALL BE PROVIDED. IN ADDITION, A PARAPET EXPANSION JOINT SHALL BE DESIGNED AND PROVIDED AT EVERY AERIAL STRUCTURE AND BRIDGE EXPANSION JOINT LOCATION. THE INSIDE FACE OF JOINT OPENING SHALL BE COVERED WITH A GALVANIZED STEEL PLATE SECURELY FASTENED TO THE INSIDE FACE OF THE PARAPET ON ONE SIDE OF THE EXPANSION JOINT WITH A LENGTH OF THREE INCHES MORE THAN THE MAXIMUM JOINT MOVEMENT LENGTH.

NON-BALLASTED TRACK			BALLASTED TRACK	
	TWO TRACK	ONE TRACK	TWO TRACK	ONE TRACK
B	2'-11 1/8"	3'-2 1/4"	3'-2 1/8" + T*	3'-5 1/4" + T*
C	7'-5 5/8"	7'-8 1/4"	7'-8 5/8" + T*	7'-11 1/4" + T*

T\* = SUM OF WATERPROOFING MEMBRANE THICKNESS AND PROTECTION LAYER THICKNESS



REV	DATE	BY	CHK	APP	DESCRIPTION

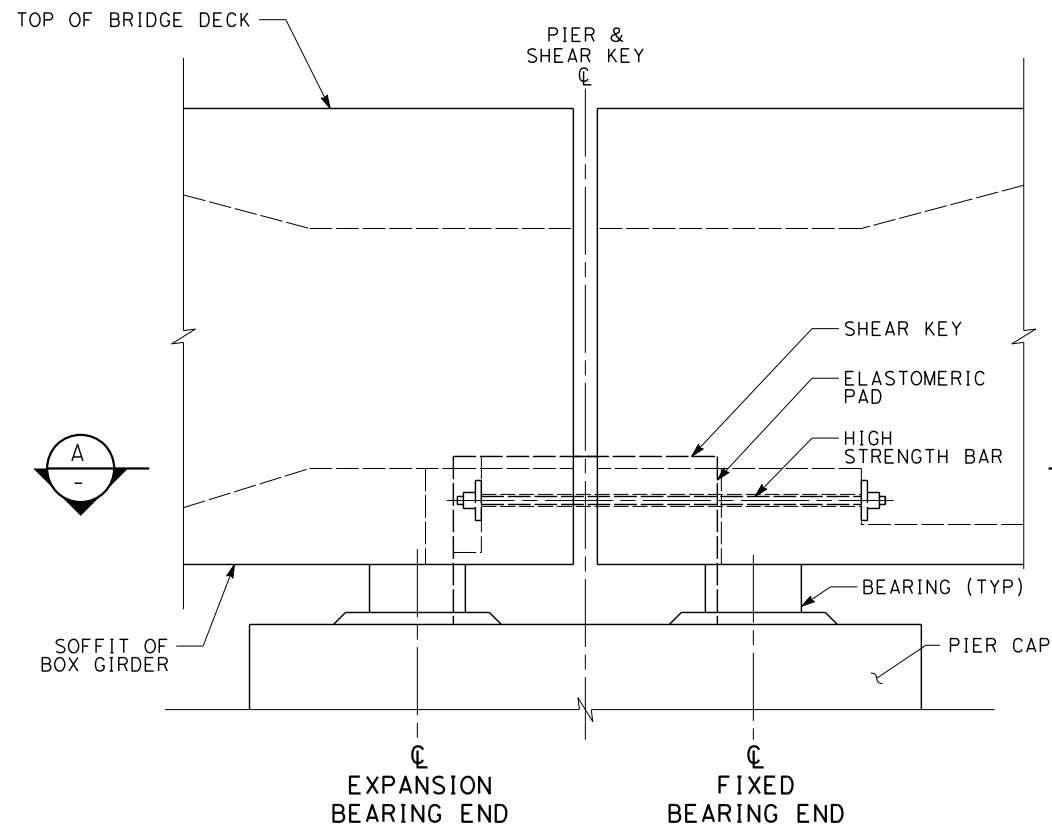
DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014



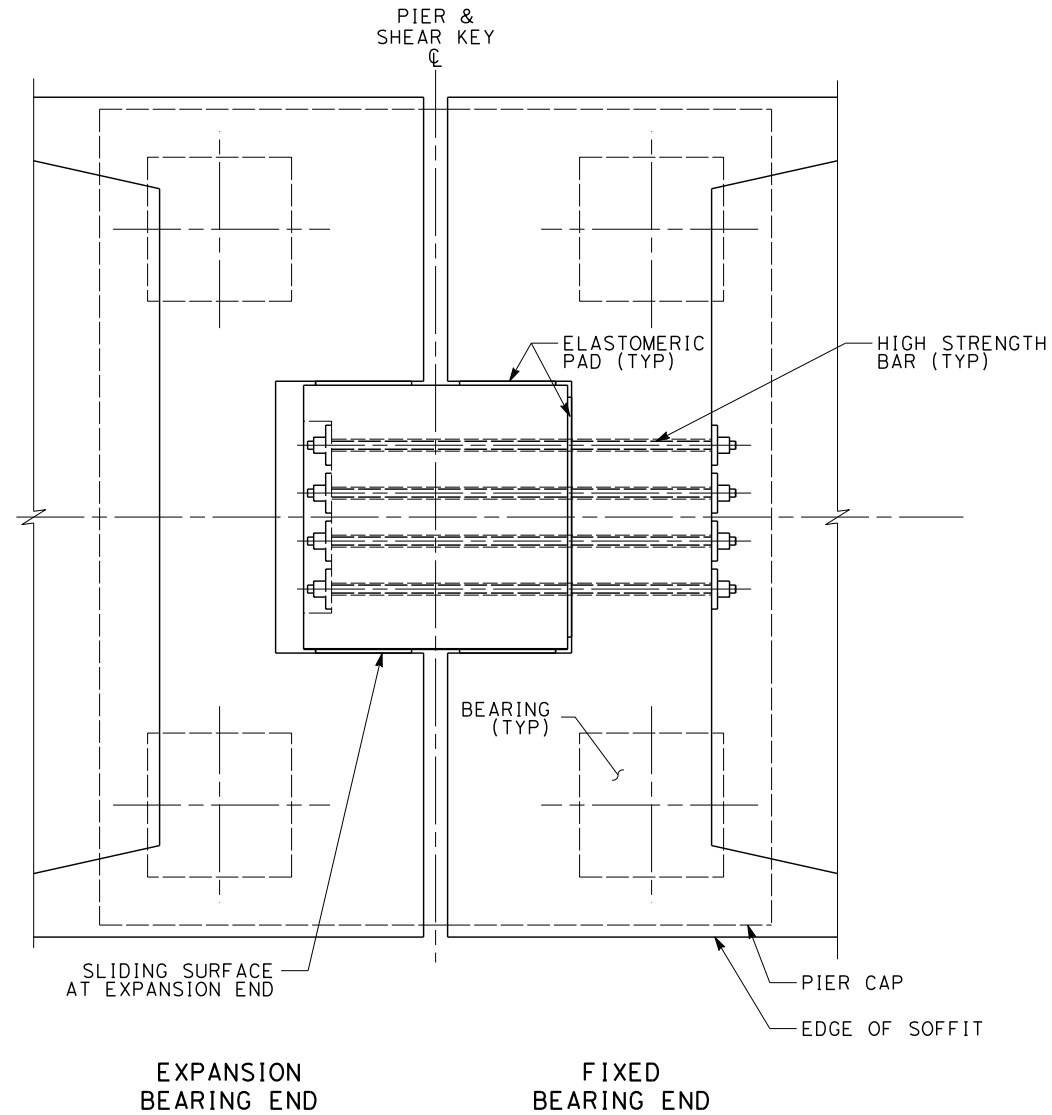

<b>CALIFORNIA HIGH-SPEED TRAIN PROJECT STRUCTURAL DIRECTIVE</b>
AERIAL STRUCTURE CONCRETE PARAPET

CONTRACT NO.
DRAWING NO. DD-ST-910
SCALE AS SHOWN
SHEET NO.

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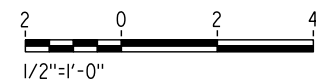
**ELEVATION**  
CONCRETE PARAPET NOT SHOWN



**SECTION**  
1/2" = 1'-0"

**NOTES:**

1. THE SHEAR KEY DETAILS SHOWN ARE FOR ILLUSTRATION ONLY. THE CONTRACTOR SHALL DEVELOP A SHEAR KEY SYSTEM THAT CONFORMS TO THE REQUIREMENTS IN THE STRUCTURES CHAPTER OF THE DESIGN CRITERIA.
2. BEARINGS SHALL BE EASILY ACCESSIBLE FOR INSPECTION AND MAINTENANCE. BEARINGS SHALL BE ADJUSTABLE AND REPLACEABLE AT ANYTIME DURING THE LIFE OF STRUCTURES WITHOUT INTERFERENCE TO NORMAL TRAIN OPERATIONS.
3. THE PROCEDURES FOR BEARING REPLACEMENT, INCLUDING THE LOCATIONS OF JACKS AND THE ALLOWED JACKING FORCES SHALL BE SPECIFIED ON THE DRAWINGS.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



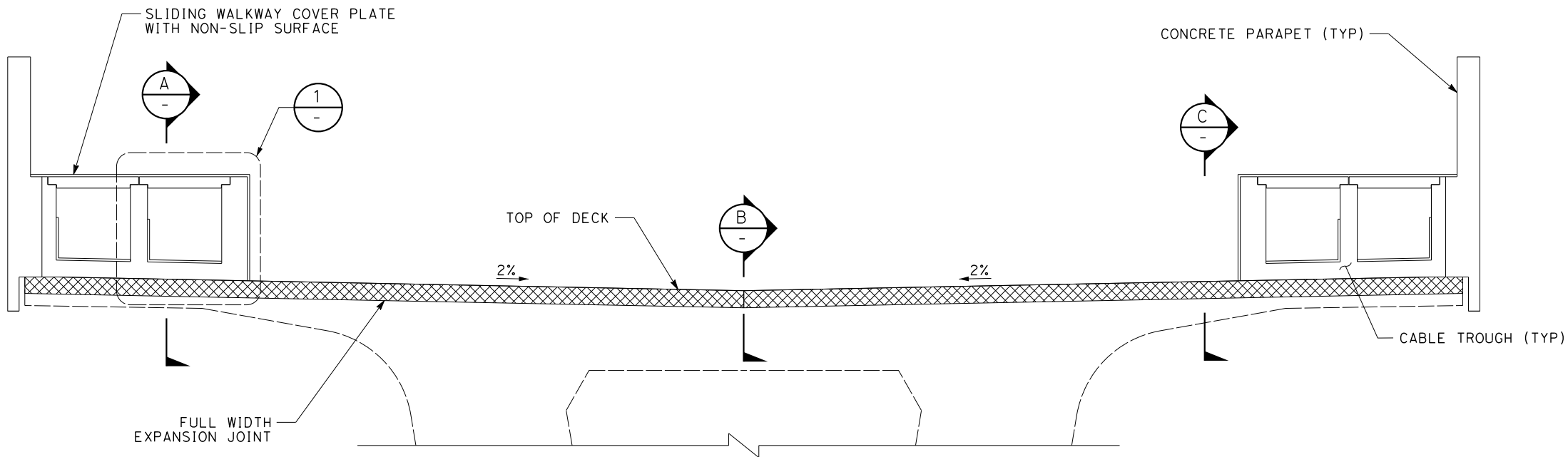
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

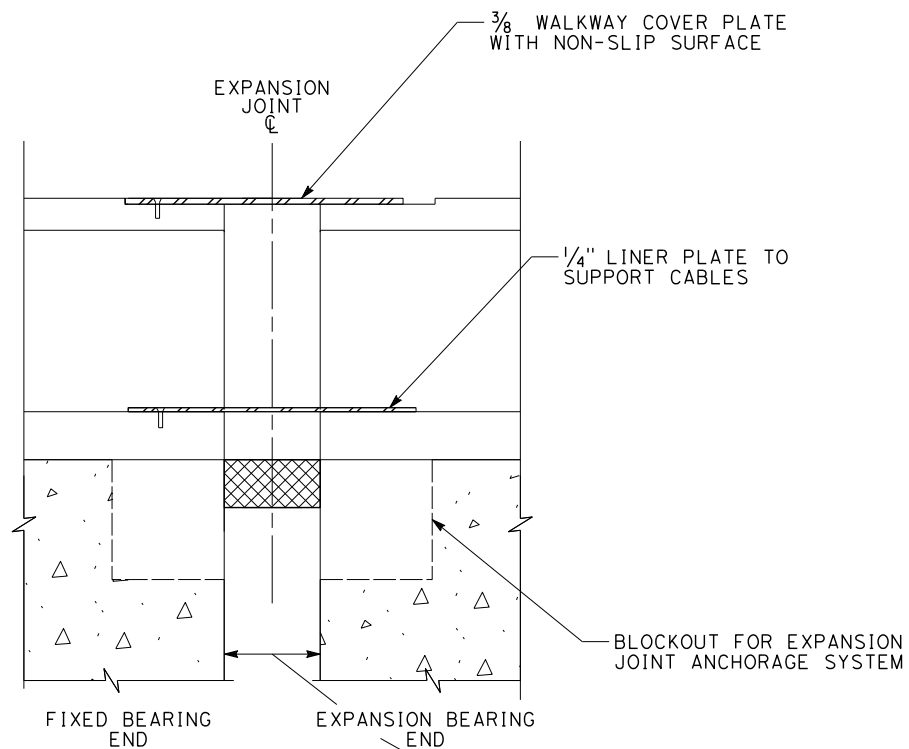
AERIAL STRUCTURE  
TYPICAL SPAN  
SHEAR KEY DETAILS

CONTRACT NO.
DRAWING NO. DD-ST-911
SCALE AS SHOWN
SHEET NO.

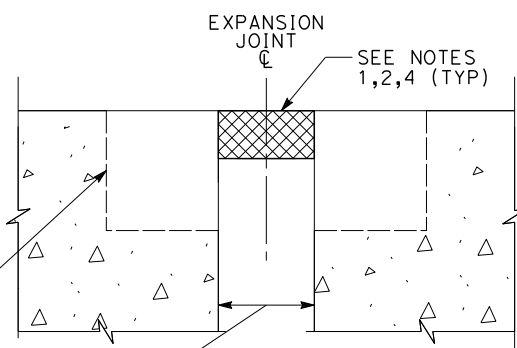
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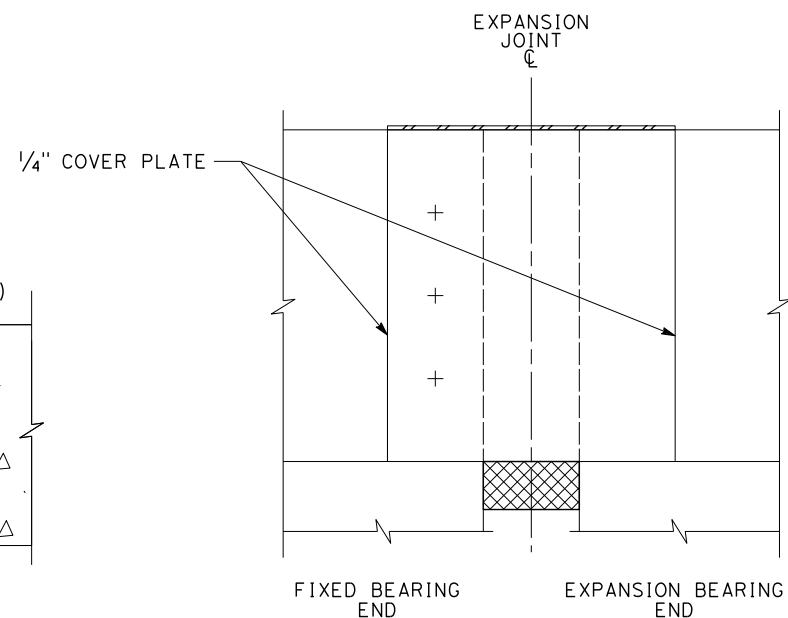
**EXPANSION JOINT SECTION**



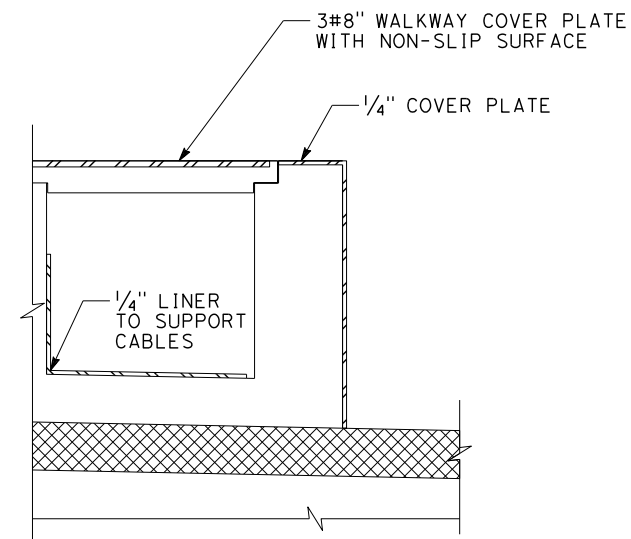
**SECTION A**



**SECTION B**



**SECTION C**



**DETAIL 1**

**NOTES:**

1. THE EXPANSION JOINT DETAILS SHOWN ARE FOR ILLUSTRATION ONLY. THE CONTRACTOR SHALL DEVELOP AN EXPANSION JOINT SYSTEM THAT CONFORMS TO THE REQUIREMENTS IN THE STRUCTURES CHAPTER OF THE DESIGN CRITERIA.
2. THE EXPANSION OPENING BETWEEN THE ENDS OF BRIDGE DECK AND ABUTMENT SHALL ACCOMMODATE THE MOVEMENT RANGE AS SPECIFIED.
3. EXPANSION JOINTS SHALL BE EASILY ACCESSIBLE FOR INSPECTION AND MAINTENANCE. EXPANSION JOINTS SHALL BE REPLACEABLE AT ANYTIME DURING THE LIFE OF STRUCTURES WITHOUT INTERFERENCE TO NORMAL TRAIN OPERATIONS.
4. THE EXPANSION JOINT SHALL BE WATERTIGHT.
5. ALL STRUCTURAL STEEL PLATES SHALL BE GALVANIZED.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



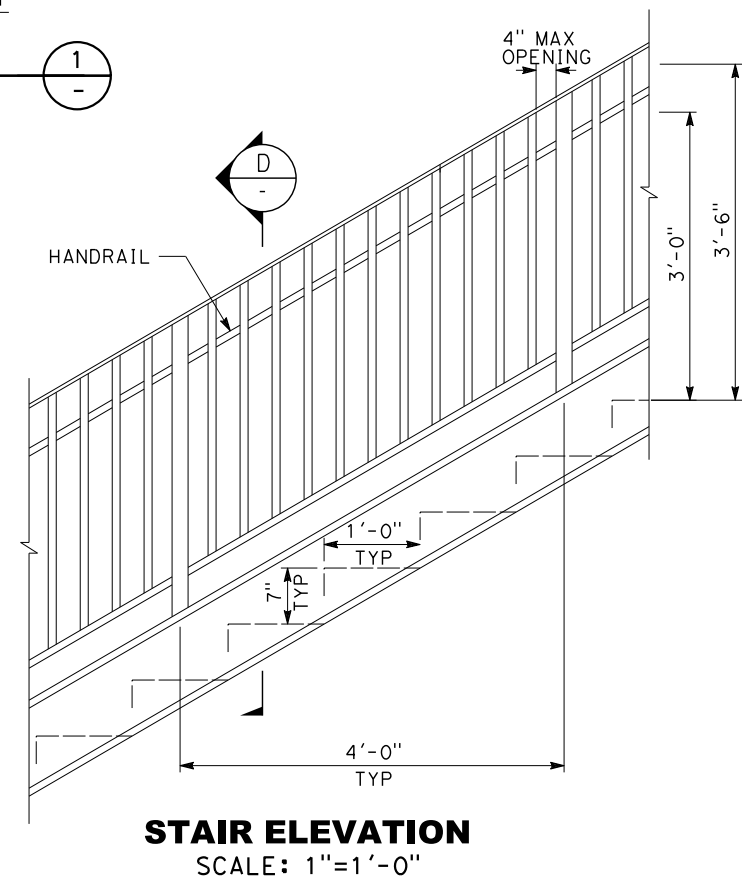
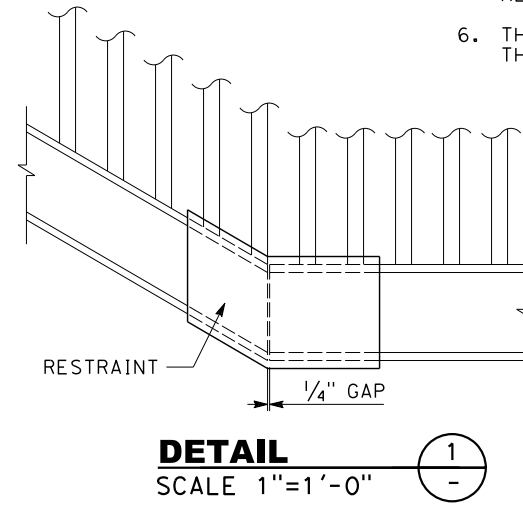
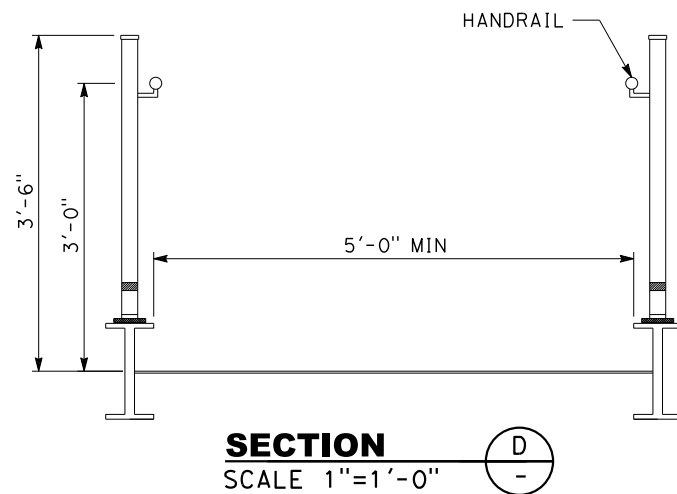
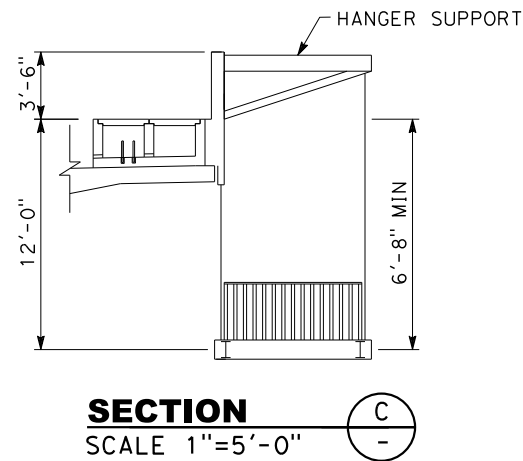
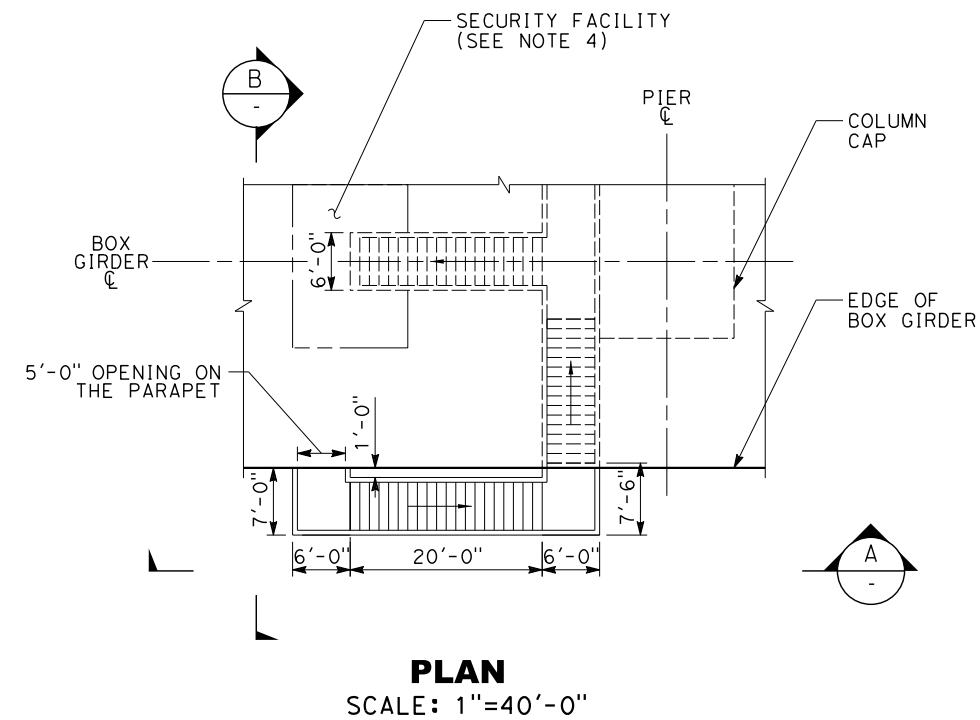
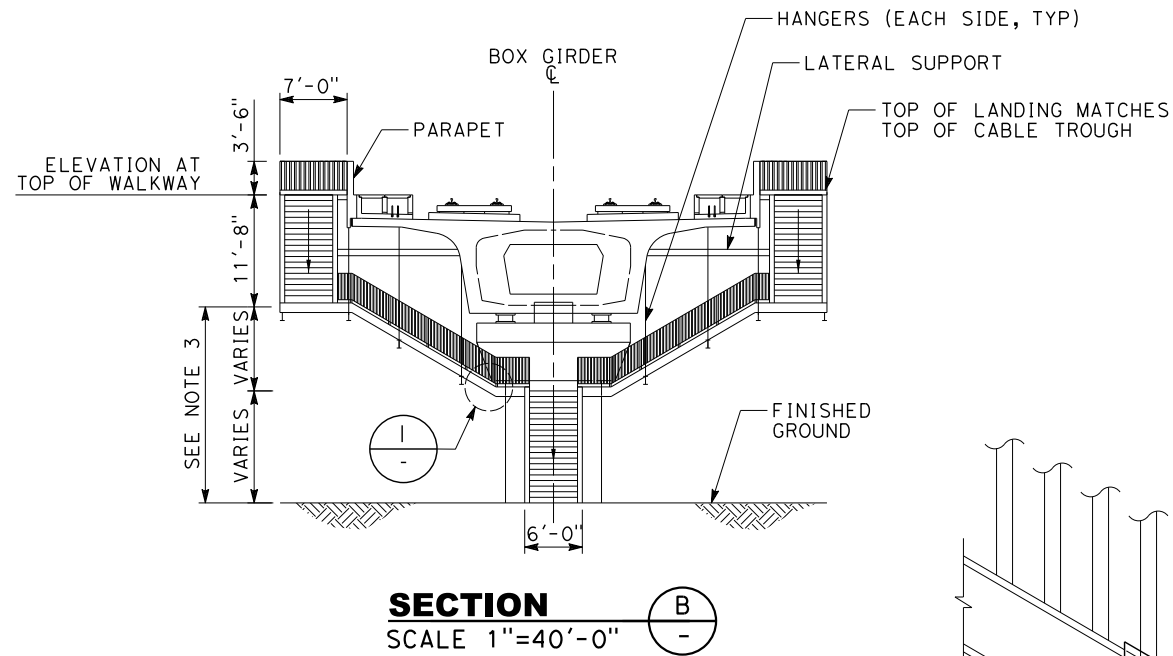
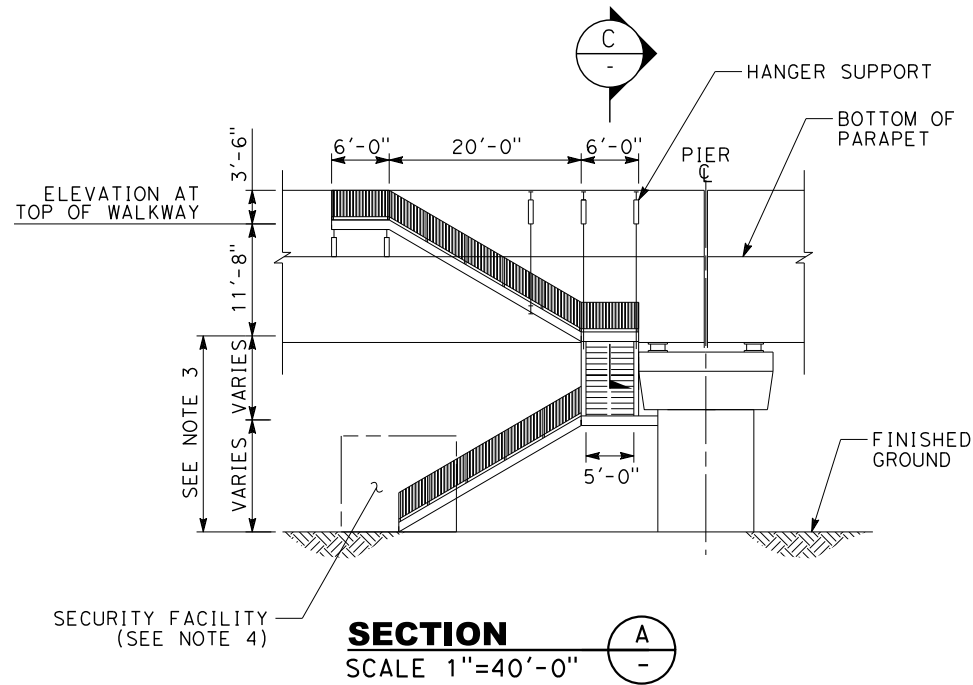
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

AERIAL STRUCTURE  
TYPICAL SPAN  
EXPANSION JOINT DETAILS

CONTRACT NO.
DRAWING NO. DD-ST-912
SCALE NO SCALE
SHEET NO.

3/30/2014 11:45:26 AM CAHSRP.tbl CHSR\_half\_black.plt c:\projectwise\pb\projectwise\int\mincio\dms32172\DD-ST-913.dgn



**NOTES:**

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. THE STAIRWAY STRUCTURAL SYSTEM SHOWN IS FOR ILLUSTRATION ONLY. THE CONTRACTOR MAY DESIGN AN EQUIVALENT STAIRWAY SYSTEM TO FIT THE SITE CONDITION.
3. WHERE VERTICAL DISTANCE BETWEEN LANDING EXCEEDS 12'-0", INTERMEDIATE LANDINGS MUST BE PROVIDED.
4. THE DESIGN OF THE SECURITY FACILITY SHALL MEET THE REQUIREMENTS OF THE EMERGENCY ACCESS/EGRESS POINTS, AS SPECIFIED IN THE SYSTEM SAFETY AND SECURITY CHAPTER OF THE DESIGN CRITERIA.
5. THE ACCESS ROAD FROM THE GATE OF SECURITY FACILITY TO THE LOCAL ROAD SHALL BE PROVIDED. THE CONTRACTOR SHALL COORDINATE WITH THE PERTINENT AUTHORITIES FOR REQUIRED EASEMENT ALONG THE AERIAL STRUCTURES.
6. THE CONTRACTOR SHALL CONSIDER THE LOADS DUE TO THE STAIRWAY IN THE DESIGN OF AERIAL STRUCTURES.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



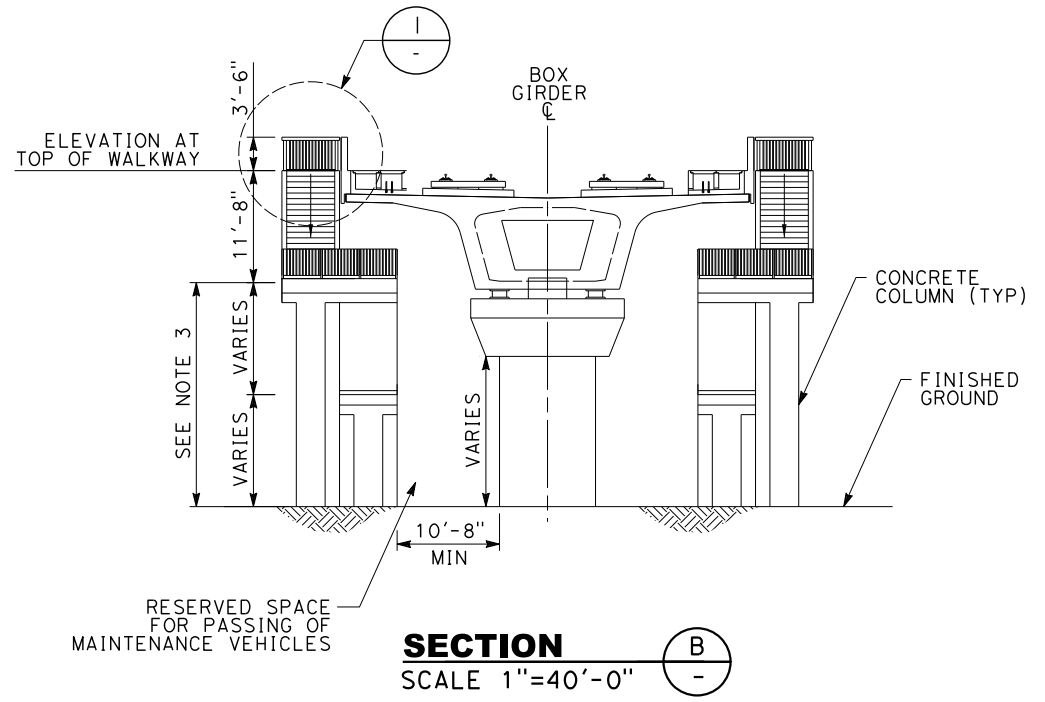
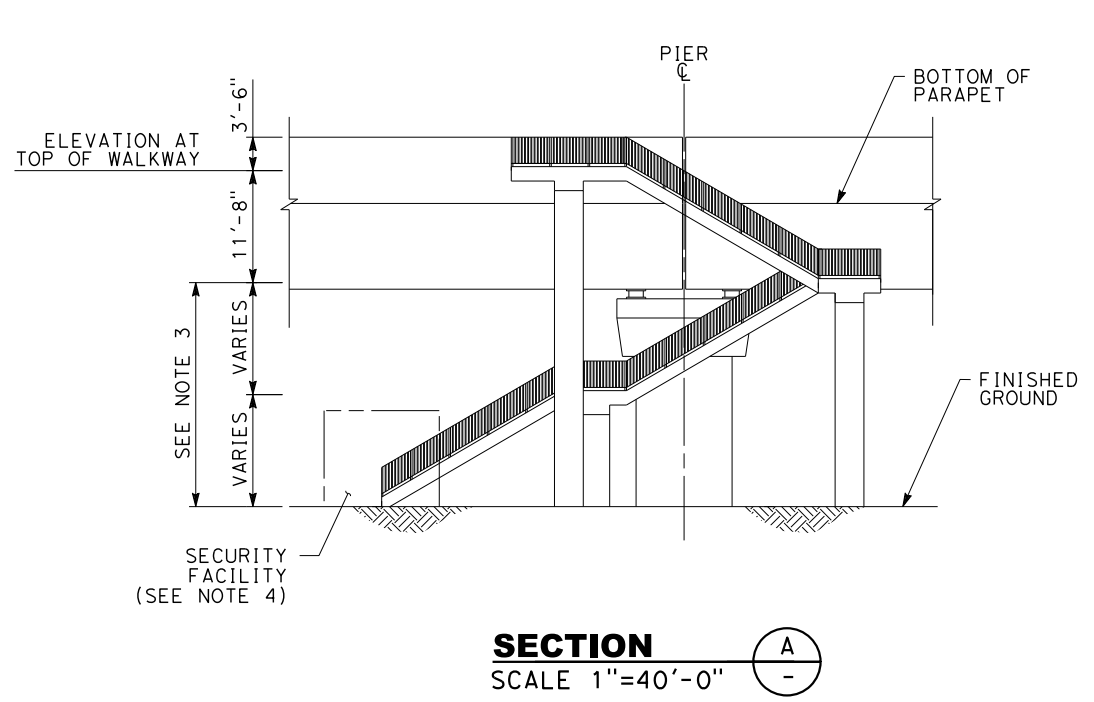
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

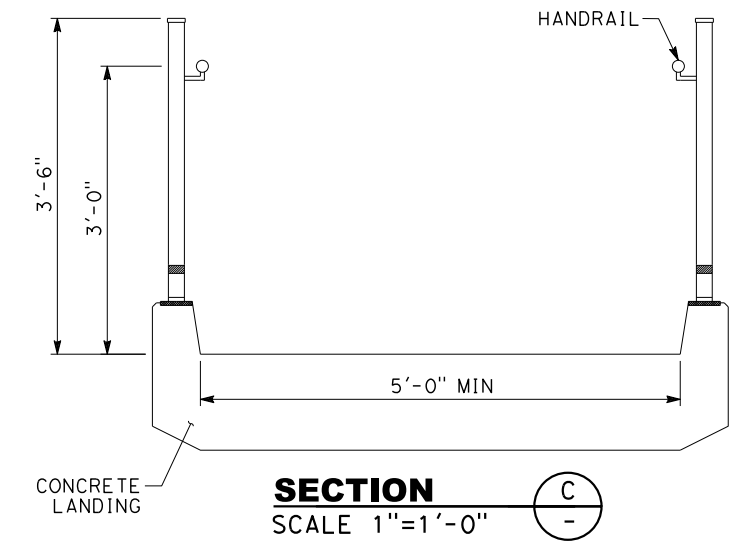
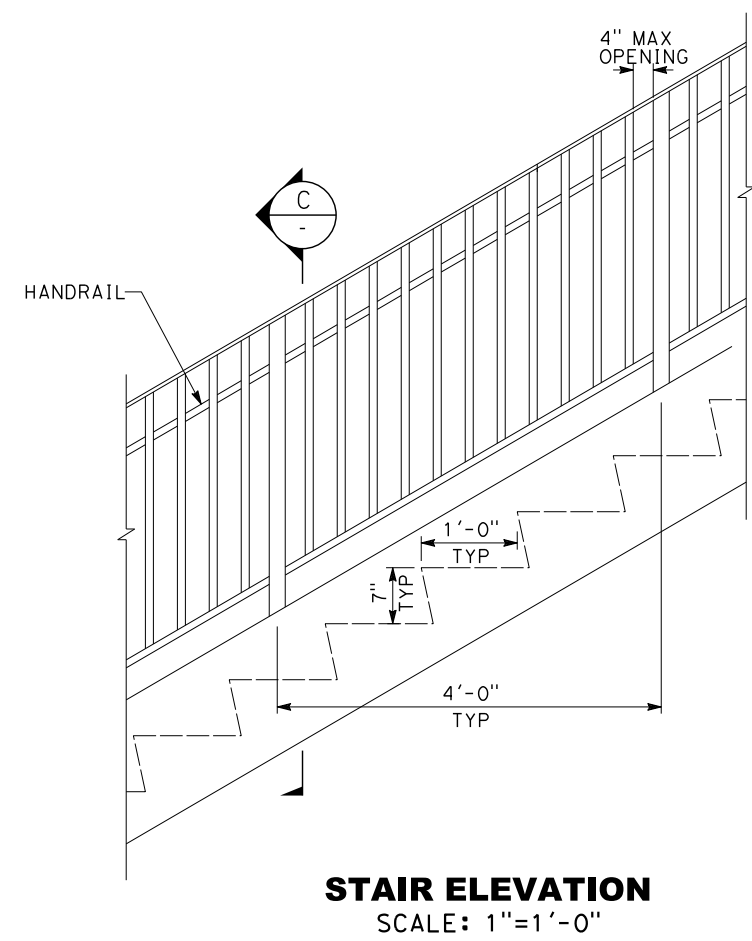
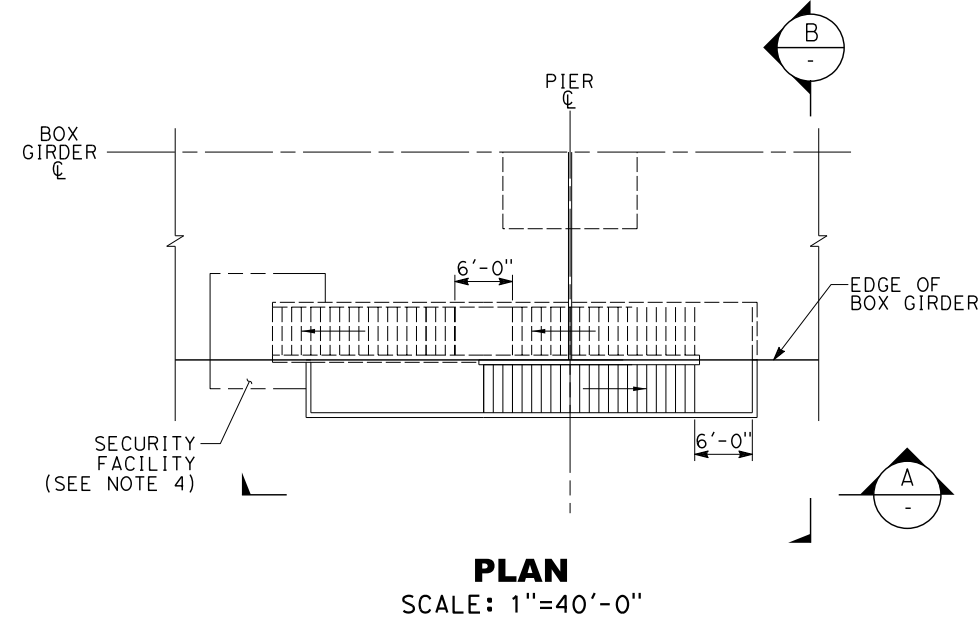
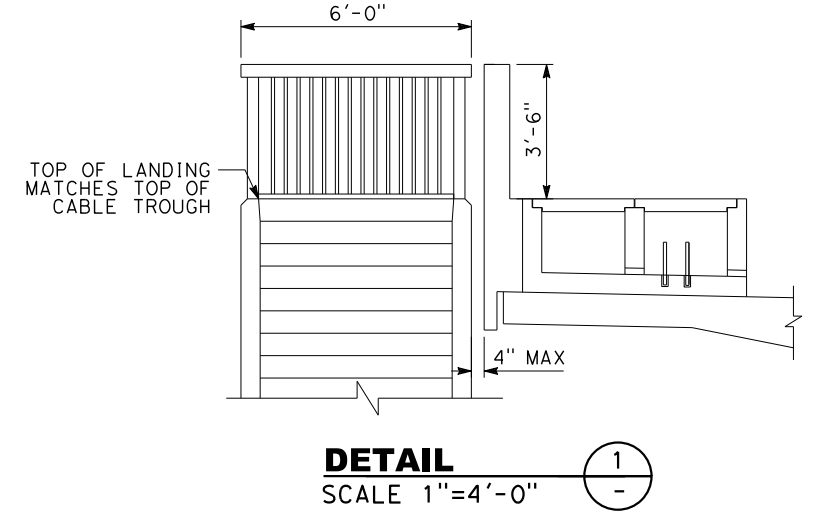
AERIAL STRUCTURE  
EMERGENCY EXIT STAIRWAY DETAILS 1

CONTRACT NO.
DRAWING NO. DD-ST-913
SCALE AS SHOWN
SHEET NO.

3/30/2014 11:51:16 AM CAHSR.tbl CHSR\_half\_black.plt c:\projectwise\pb\projectwise\int\mincio\dms32172\DD-ST-914.dgn mincio



- NOTES:**
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. THE STAIRWAY STRUCTURAL SYSTEM SHOWN IS FOR ILLUSTRATION ONLY. THE CONTRACTOR MAY DESIGN AN EQUIVALENT STAIRWAY SYSTEM TO FIT THE SITE CONDITION.
  3. WHERE VERTICAL DISTANCE BETWEEN LANDING EXCEEDS 12'-0", INTERMEDIATE LANDINGS SHALL BE PROVIDED.
  4. THE DESIGN OF THE SECURITY FACILITY SHALL MEET THE REQUIREMENTS OF THE EMERGENCY ACCESS/EGRESS POINTS, AS SPECIFIED IN THE SYSTEM SAFETY AND SECURITY CHAPTER OF THE DESIGN CRITERIA.
  5. THE ACCESS ROAD FROM THE GATE OF SECURITY FACILITY TO THE LOCAL ROAD SHALL BE PROVIDED. THE CONTRACTOR SHALL COORDINATE WITH THE PERTINENT AUTHORITIES FOR REQUIRED EASEMENT ALONG THE AERIAL STRUCTURES.
  6. THE CONTRACTOR SHALL CONSIDER THE LOADS DUE TO THE STAIRWAY IN THE DESIGN OF AERIAL STRUCTURES.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY P. LIN
DRAWN BY V. HUANTE
CHECKED BY K. PUGASAP
IN CHARGE G. LUSHEROVICH
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**

**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
STRUCTURAL DIRECTIVE**

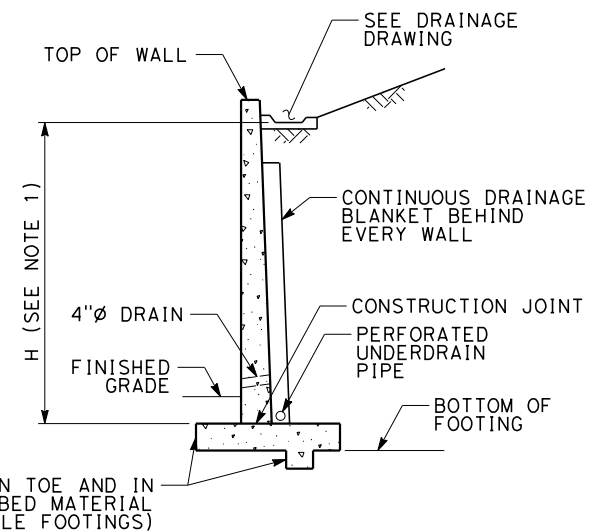
AERIAL STRUCTURE  
EMERGENCY EXIT STAIRWAY DETAILS 2

CONTRACT NO.

DRAWING NO.  
DD-ST-914

SCALE  
AS SHOWN

SHEET NO.



## TYPICAL SECTION



## WALL OFFSET VALUES

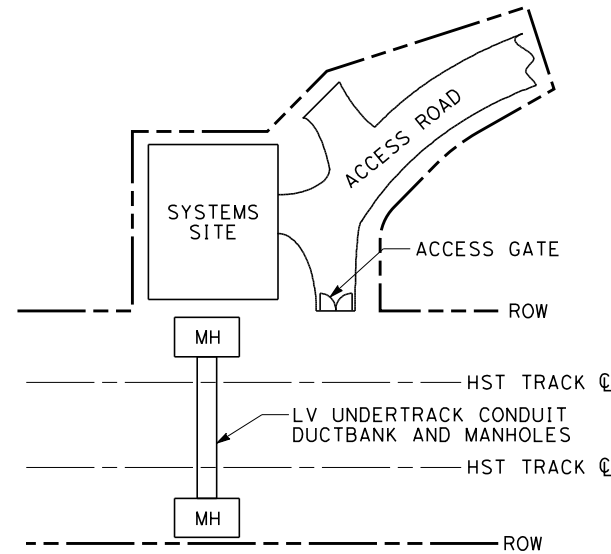
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08/29/2014

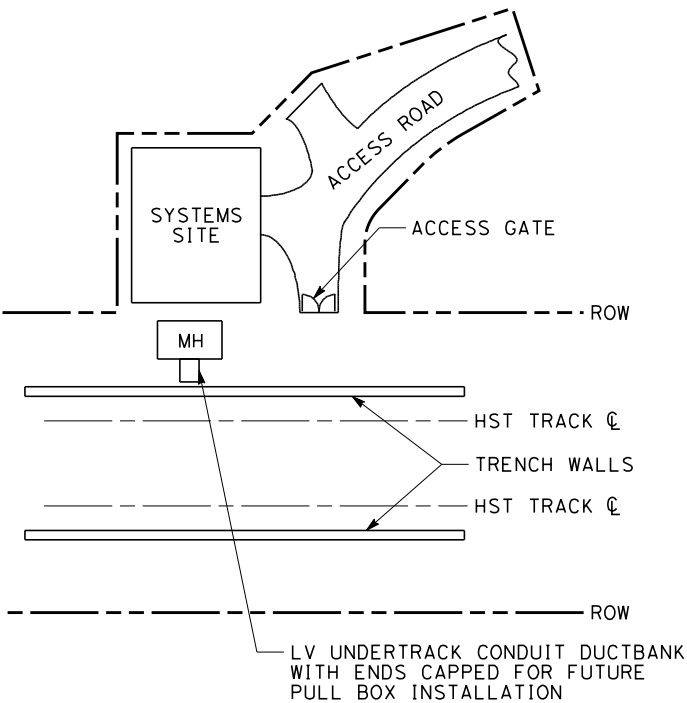
CONTRACT NO.	
DRAWING NO.	DD-ST-920
SCALE	NO SCALE
SHEET NO.	



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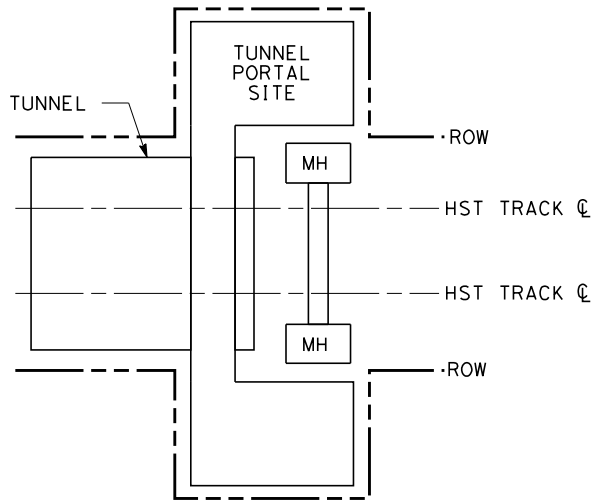


**DIAGRAM A**  
AT-GRADE LOW-VOLTAGE UNDERTRACK  
CONDUIT DUCTBANK, ACCESS ROADS AND  
GATES AT SYSTEMS SITE

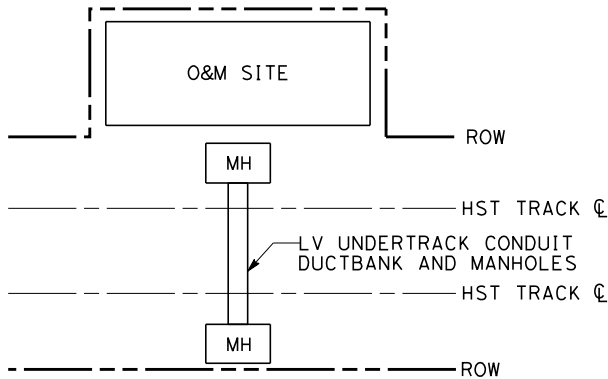


**DIAGRAM B**  
LOW-VOLTAGE UNDERTRACK  
DUCTBANK AT STATION PLATFORMS

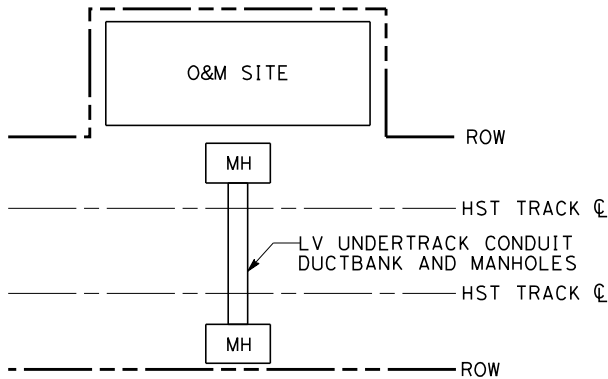
**DIAGRAM D**  
TRENCH LOW-VOLTAGE UNDERTRACK  
CONDUIT DUCT BANK AND ACCESS ROADS  
AND GATES AT SYSTEMS SITE



**DIAGRAM C**  
AT-GRADE LOW-VOLTAGE UNDERTRACK AND UNDERGROUND  
CONDUIT DUCT BANK, 25KV UNDERGROUND CONDUIT DUCT  
BANK, ACCESS ROADS AND GATES AT SYSTEMS SITE  
LOCATED AWAY FROM HSR ROW

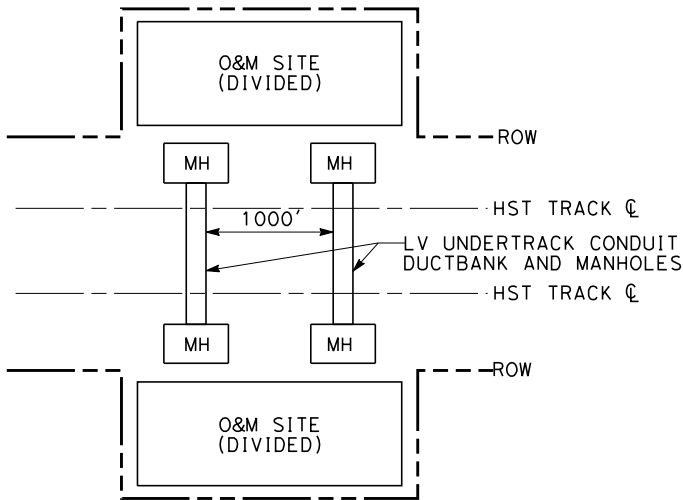


**DIAGRAM E**  
AT-GRADE LOW-VOLTAGE UNDERTRACK  
CONDUIT DUCTBANK AT TUNNEL PORTAL SITES



**DIAGRAM F**  
AT-GRADE LOW-VOLTAGE UNDERTRACK  
CONDUIT DUCTBANK AT O&M FACILITIES  
UNDIVIDED

- NOTES:**
1. SYSTEM SITES INCLUDE TRACTION POWER FACILITIES, TRAIN CONTROL HOUSES, STANDALONE RADIO SITES.
  2. TYPICALLY THERE ARE FOUR 25KV UNDERGROUND CONDUIT DUCTBANKS AND ACCOMPANYING MANHOLES PER TRACTION POWER SITE.
  3. ACCESS ROADS AND ACCESS GATES ARE SHOWN FOR INFORMATION ONLY. CONSULT CIVIL DESIGN CRITERIA AND PRELIMINARY DESIGN PLANS FOR REQUIREMENTS AND DETAILS.
  4. SEE TRACTION POWER AND COMMUNICATIONS DRAWINGS FOR DUCTBANK, MANHOLE CROSS SECTIONS, DETAILS AND ELEVATIONS.
  5. FOR NUMBERS OF CONDUITS SEE COMMUNICATION DESIGN CRITERIA AND DRAWING "TYPICAL CROSS SECTION SYSTEMS LOW-VOLTAGE CONDUIT DUCTBANK".
  6. INTERMEDIATE MANHOLES TO BE INCLUDED BASED UPON APPLICABLE STANDARDS, REGULATIONS AND CODES.



**DIAGRAM G**  
AT-GRADE LOW-VOLTAGE UNDERTRACK  
CONDUIT DUCTBANK AT O&M FACILITIES  
DIVIDED BY MAINLINE TRACK

B	TBD				POST CP01 CONFORMED SET
A	05/31/13				EXECUTION VERSION
REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY B. BANKS
DRAWN BY V. HUANTE
CHECKED BY C. DALOIA
IN CHARGE R. SCHMEDES
DATE 11/19/2013

**PARSONS  
BRINCKERHOFF**



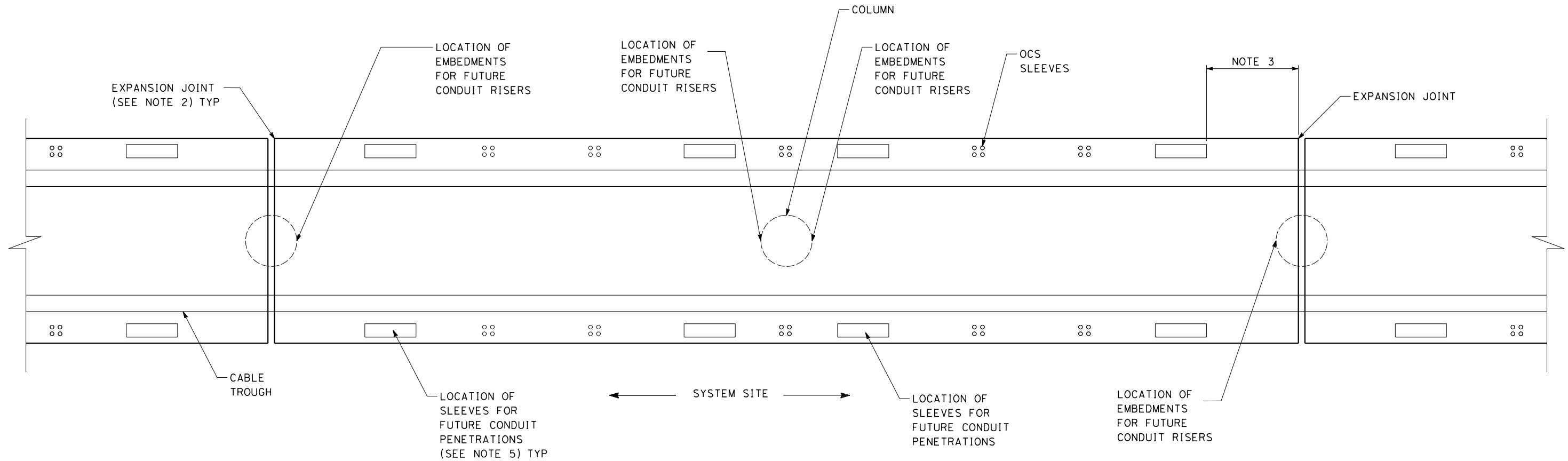
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
SYSTEMS DIRECTIVE**

TYPICAL CIVIL ACCOMMODATIONS FOR SYSTEMS  
AT SYSTEM SITES, STATIONS,  
TUNNEL PORTAL FACILITIES AND O&M FACILITIES

CONTRACT NO.
DRAWING NO. DD-SY-010
SCALE NO SCALE
SHEET NO.

Laverdev 9/30/2014 11:52:10 AM CAHSR.tbl CHSR\_PDF\_half\_black.plt c:\projectwise\pb\projectwise\int\laverdev\dms32178\DD-SY-030.dgn



PLAN

NOTES:

1. STRUCTURAL DESIGN DETAILS, CABLE TROUGH AND OCS SLEEVES SHOWN HERE ARE SCHEMATIC ONLY.
2. SLEEVE PENETRATION LOCATIONS SHALL BE LOCATED NOMINALLY  $10\frac{9}{32}$  FROM THE EXPANSION JOINT.
3. SLEEVE PENETRATION LOCATIONS FOR FUTURE CONDUIT PENETRATIONS SHALL BE PROVIDED IN LINE WITH THE OCS POLE FOUNDATIONS.
4. FOR EACH SLEEVE PENETRATION, AREA SHALL BE SIZED TO HOUSE 10 TRADE SIZE 4 CONDUITS.
5. FOR CONDUIT RISER EMBEDMENTS AND PENETRATIONS ON AERIAL STRUCTURE REQUIREMENTS, REFER TO STRUCTURES CHAPTER OF THE DESIGN CRITERIA. PENETRATIONS SHALL BE PLACED AT THE NEAREST 3 COLUMNS TO THE SYSTEMS SITE OR FACILITY AS SHOWN.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY G. SPADAFORE
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

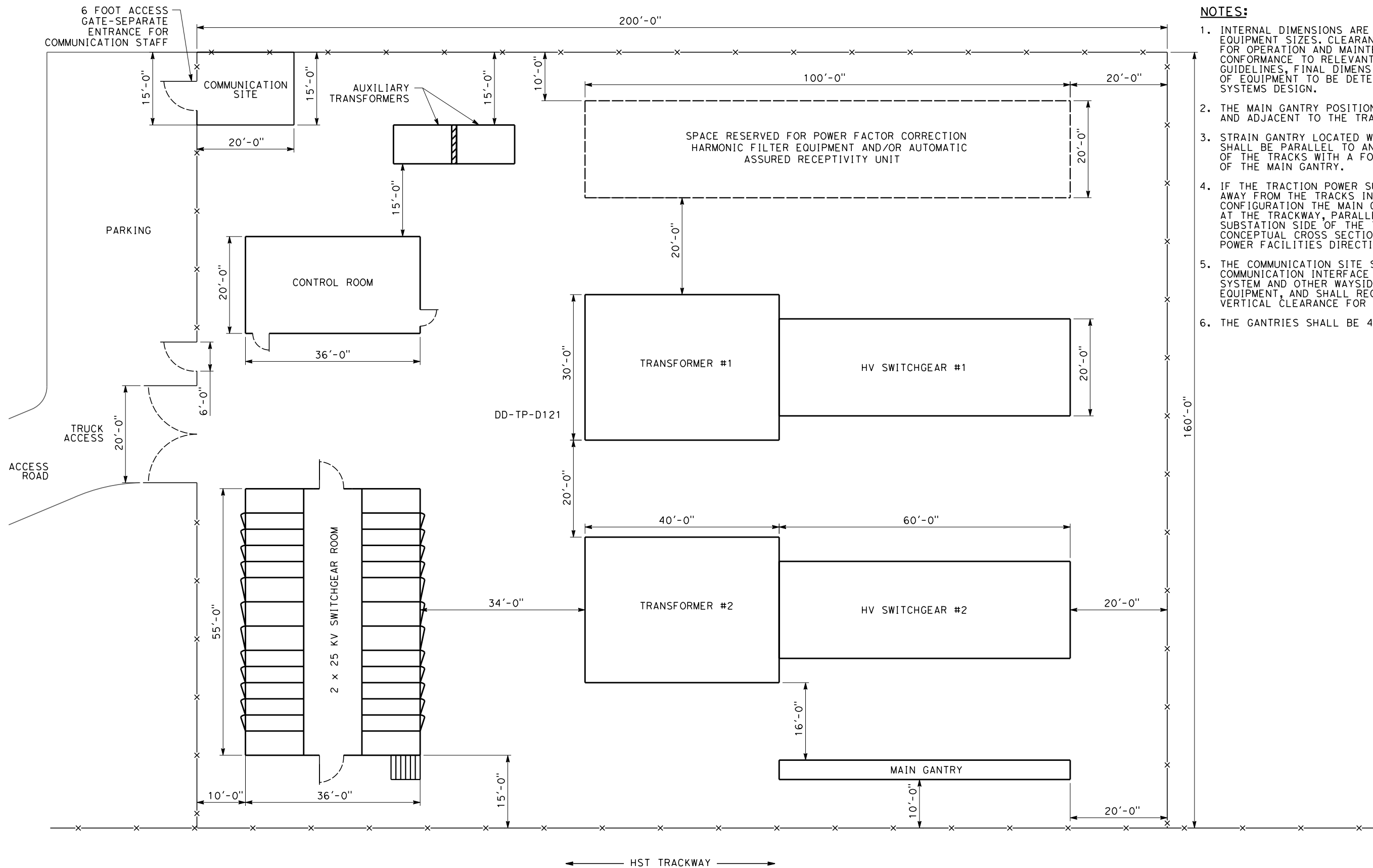
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE**

SYSTEMS SITE LOCATION AT AERIAL STRUCTURE  
EMBEDMENTS AND KNOCKOUTS

CONTRACT NO.
DRAWING NO. DD-SY-030
SCALE NO SCALE
SHEET NO.

9/30/2014 12:10:37 PM CAHSR.tbl CAHSR\_PDF\_half\_black.plt c:\projectwise\bb\projectwise\int\laverdev\dms17831\DD-TP-D101.dgn

Laverdev



#### NOTES:

1. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES, CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT AND CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES. FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.
2. THE MAIN GANTRY POSITION SHALL BE PARALLEL TO AND ADJACENT TO THE TRACKWAY.
3. STRAIN GANTRY LOCATED WITHIN THE RIGHT-OF-WAY, SHALL BE PARALLEL TO AND ON THE OPPOSITE SIDE OF THE TRACKS WITH A FOOTPRINT EQUAL TO THAT OF THE MAIN GANTRY.
4. IF THE TRACTION POWER SUBSTATION IS LOCATED AWAY FROM THE TRACKS IN AN UNDESIRABLE CONFIGURATION THE MAIN GANTRY SHALL BE LOCATED AT THE TRACKWAY, PARALLEL TO AND TOWARDS SUBSTATION SIDE OF THE TRACKS. REFER TO CONCEPTUAL CROSS SECTIONS OF AWAY TRACTION POWER FACILITIES DIRECTIVE DRAWINGS.
5. THE COMMUNICATION SITE SHALL HOUSE COMMUNICATION INTERFACE EQUIPMENT FOR SCADA SYSTEM AND OTHER WAYSIDE COMMUNICATION EQUIPMENT, AND SHALL REQUIRE MINIMUM 100' VERTICAL CLEARANCE FOR RADIO TOWER.
6. THE GANTRIES SHALL BE 40 FEET HIGH (TYP).

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



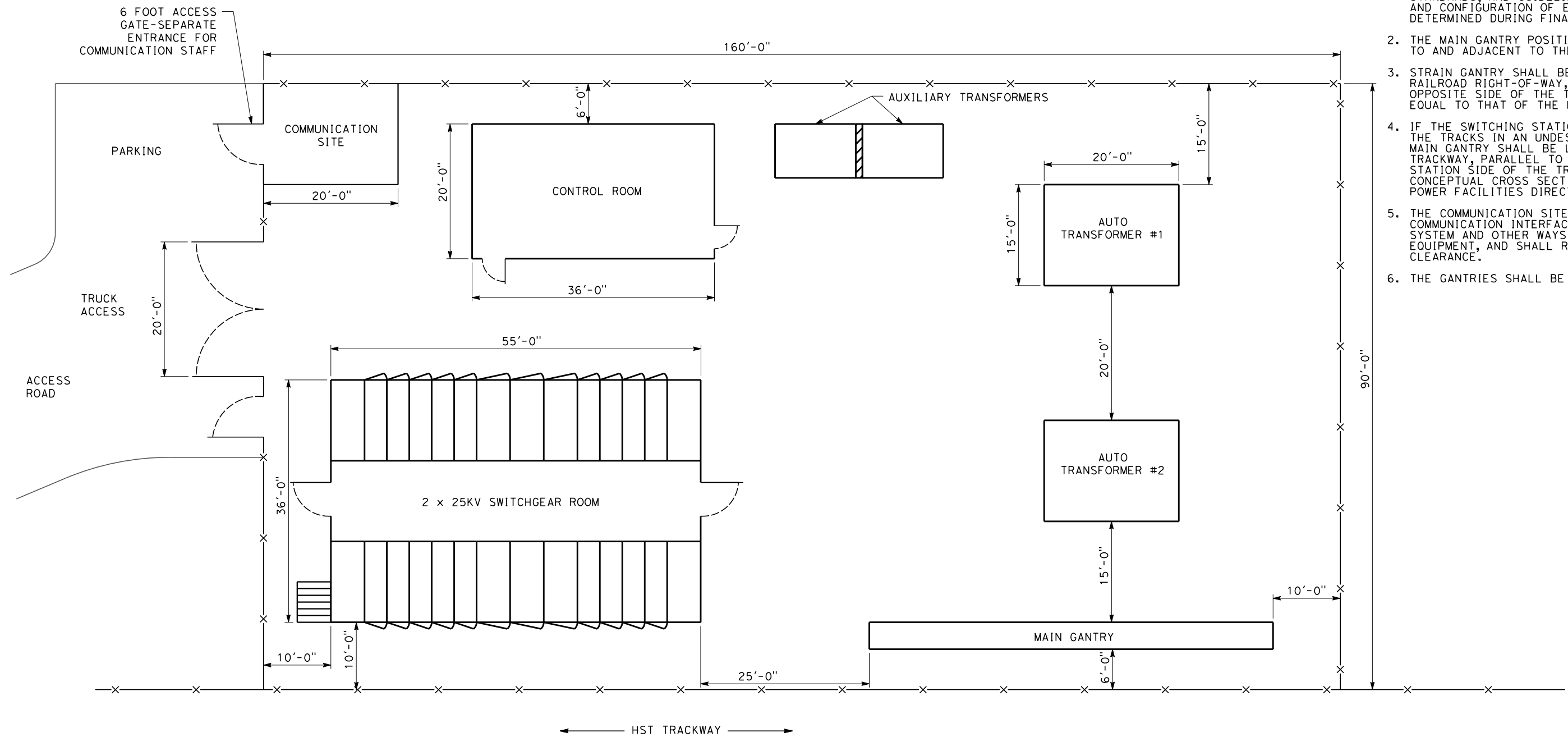
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

#### CALIFORNIA HIGH-SPEED TRAIN PROJECT TRACTION POWER DIRECTIVE

CONCEPTUAL LAYOUT  
TRACTION POWER SUBSTATION  
WITH TWO HIGH-VOLTAGE TRANSFORMERS

CONTRACT NO.
DRAWING NO. DD-TP-D101
SCALE NO SCALE
SHEET NO.

9/30/2014 12:13:40 PM CAHSR.tbl CAHSR.plt c:\projectwise\bb\projectwise\int\laverdev\dms17831\DD-TP-D201.dgn Laverdev



NOTES:

1. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES. CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT AND CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES, FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.
2. THE MAIN GANTRY POSITION SHALL BE PARALLEL TO AND ADJACENT TO THE TRACKS.
3. STRAIN GANTRY SHALL BE LOCATED WITHIN THE RAILROAD RIGHT-OF-WAY, PARALLEL TO AND ON THE OPPOSITE SIDE OF THE TRACKS WITH A FOOTPRINT EQUAL TO THAT OF THE MAIN GANTRY.
4. IF THE SWITCHING STATION IS LOCATED AWAY FROM THE TRACKS IN AN UNDESIRABLE CONFIGURATION, THE MAIN GANTRY SHALL BE LOCATED AT THE TRACKWAY, PARALLEL TO AND TOWARDS SWITCH STATION SIDE OF THE TRACKS. REFER TO CONCEPTUAL CROSS SECTIONS OF AWAY TRACTION POWER FACILITIES DIRECTIVE DRAWINGS.
5. THE COMMUNICATION SITE SHALL HOUSE COMMUNICATION INTERFACE EQUIPMENT FOR SCADA SYSTEM AND OTHER WAYSIDE COMMUNICATION EQUIPMENT, AND SHALL REQUIRE 100' VERTICAL CLEARANCE.
6. THE GANTRIES SHALL BE 40 FEET HIGH (TYP).

RFP No. HSR 14-32 - INITIAL RELEASE - 05/27/2015

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY  
M. PAZ  
DRAWN BY  
V. HUANTE  
CHECKED BY  
V. SIBAL  
IN CHARGE  
B. BANKS  
DATE  
8/29/2014

PARSONS  
BRINCKERHOFF



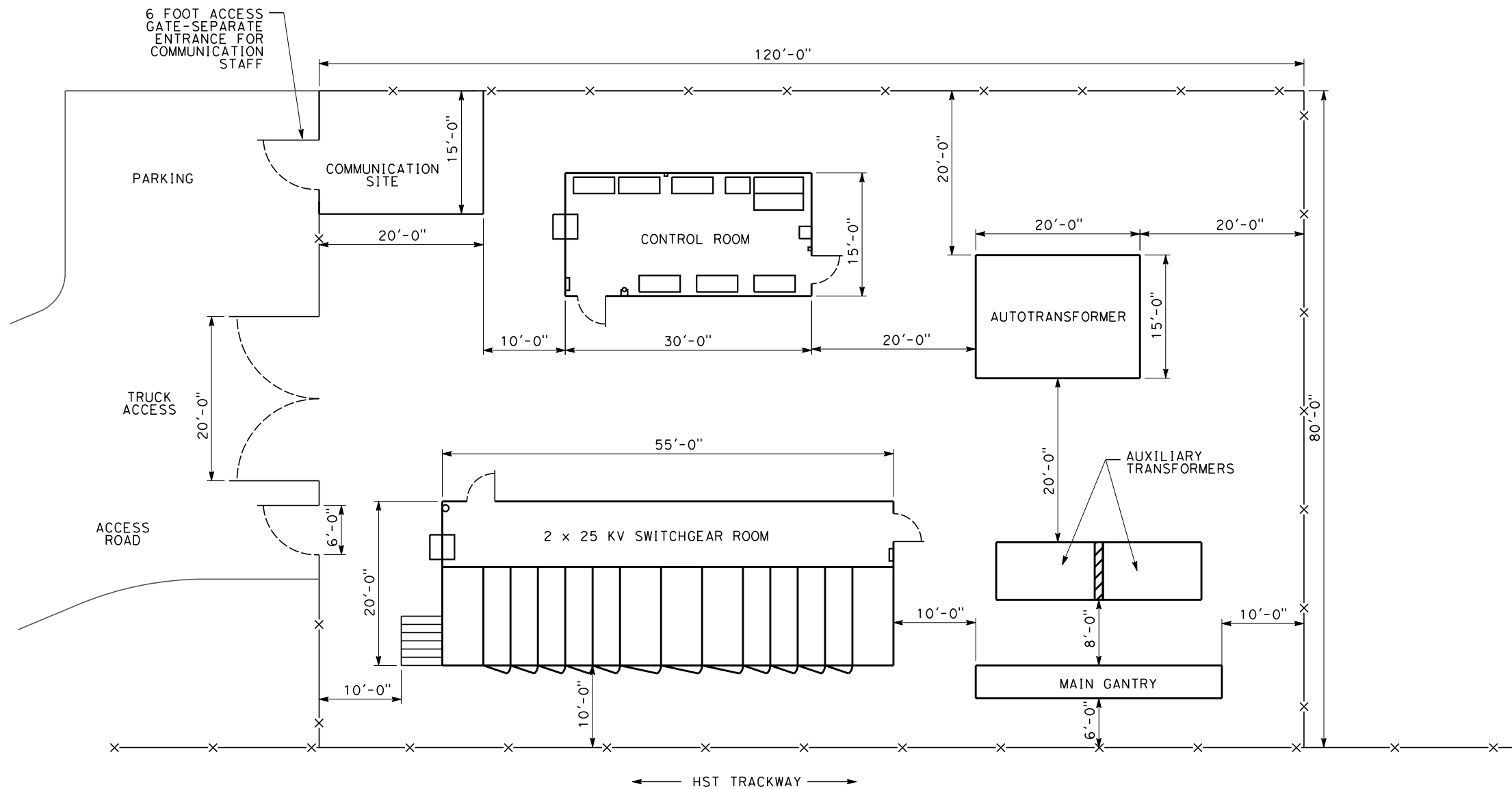
CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE

CONCEPTUAL LAYOUT  
SWITCHING STATION

CONTRACT NO.  
DRAWING NO.  
DD-TP-D201  
SCALE  
NO SCALE  
SHEET NO.

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#### NOTES:

1. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES. CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES, FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.
2. THE MAIN GANTRY POSITION SHALL BE PARALLEL TO AND ADJACENT TO THE TRACKS.
3. STRAIN GANTRY SHALL BE LOCATED WITHIN THE RAILROAD RIGHT-OF-WAY, PARALLEL TO AND ON THE OPPOSITE SIDE OF THE TRACKS WITH FOOTPRINT EQUAL TO THAT OF THE MAIN GANTRY.
4. IF THE PARALLELING STATION (PS) IS LOCATED AWAY FROM THE TRACKS IN AN UNDESIRABLE CONFIGURATION, THE MAIN GANTRY SHALL BE LOCATED AT THE TRACKWAY, PARALLEL TO AND TOWARDS PS SIDE OF THE TRACKS. REFER TO CONCEPTUAL CROSS SECTIONS OF AWAY TRACTION POWER FACILITIES.
5. THE COMMUNICATION SITE SHALL HOUSE COMMUNICATION INTERFACE EQUIPMENT FOR SCADA SYSTEM AND OTHER WAYSIDE COMMUNICATION EQUIPMENT, AND SHALL REQUIRE 100' VERTICAL CLEARANCE.
6. THE GANTRIES SHALL BE 40 FEET HIGH (TYP).

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. PAZ
DRAWN BY V. LAVERDE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

#### CALIFORNIA HIGH-SPEED TRAIN PROJECT TRACTION POWER DIRECTIVE

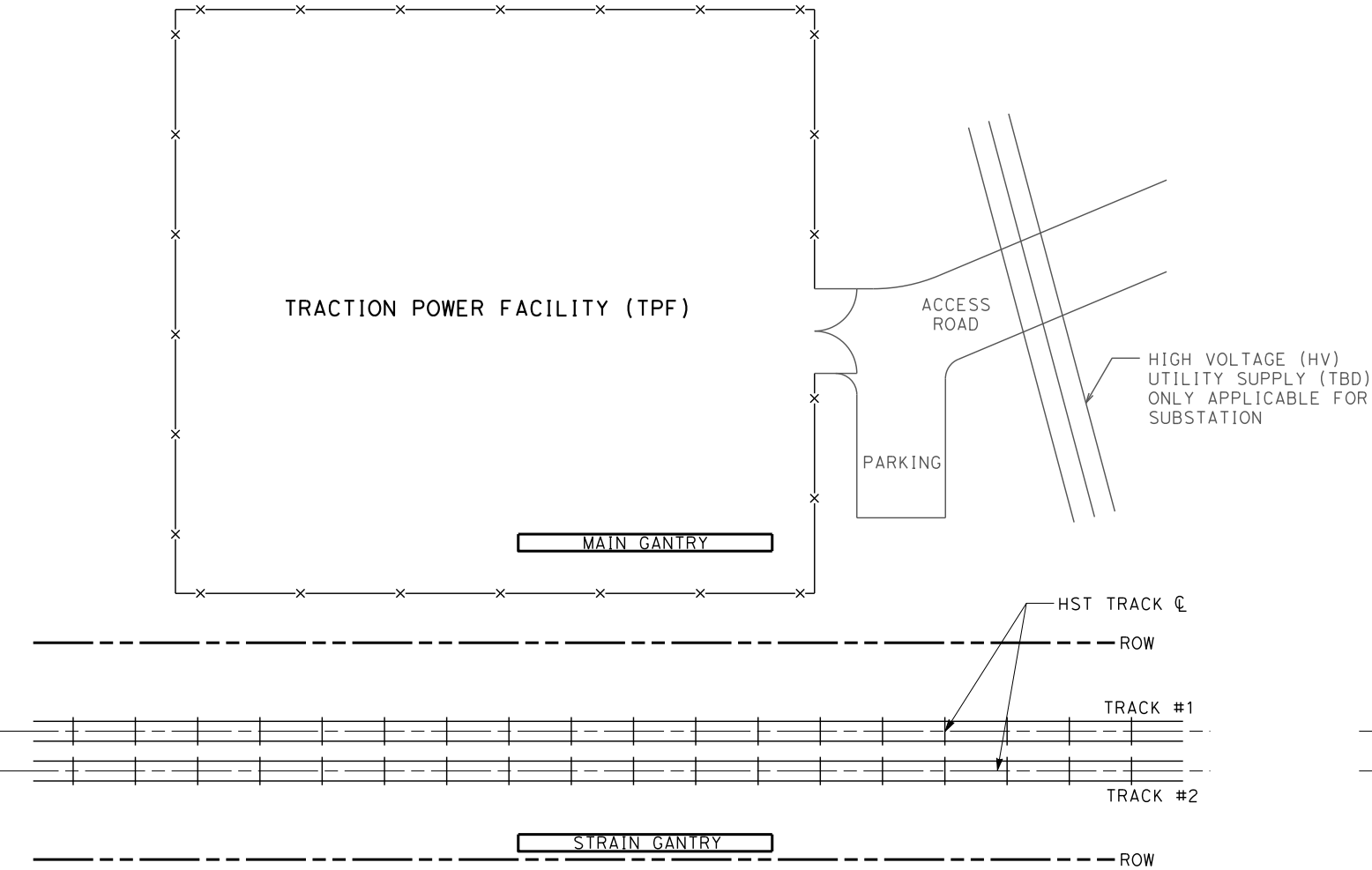
CONCEPTUAL LAYOUT  
PARALLELING STATION

CONTRACT NO.
DRAWING NO. DD-TP-D301
SCALE NO SCALE
SHEET NO.

3/30/2014 12:04:50 PM CAHSR.tbl CHSR\_half\_black.plt c:\projectwise\pb\projectwise\int\mincio\dmst7831\DD-TP-D401.dgn mincio

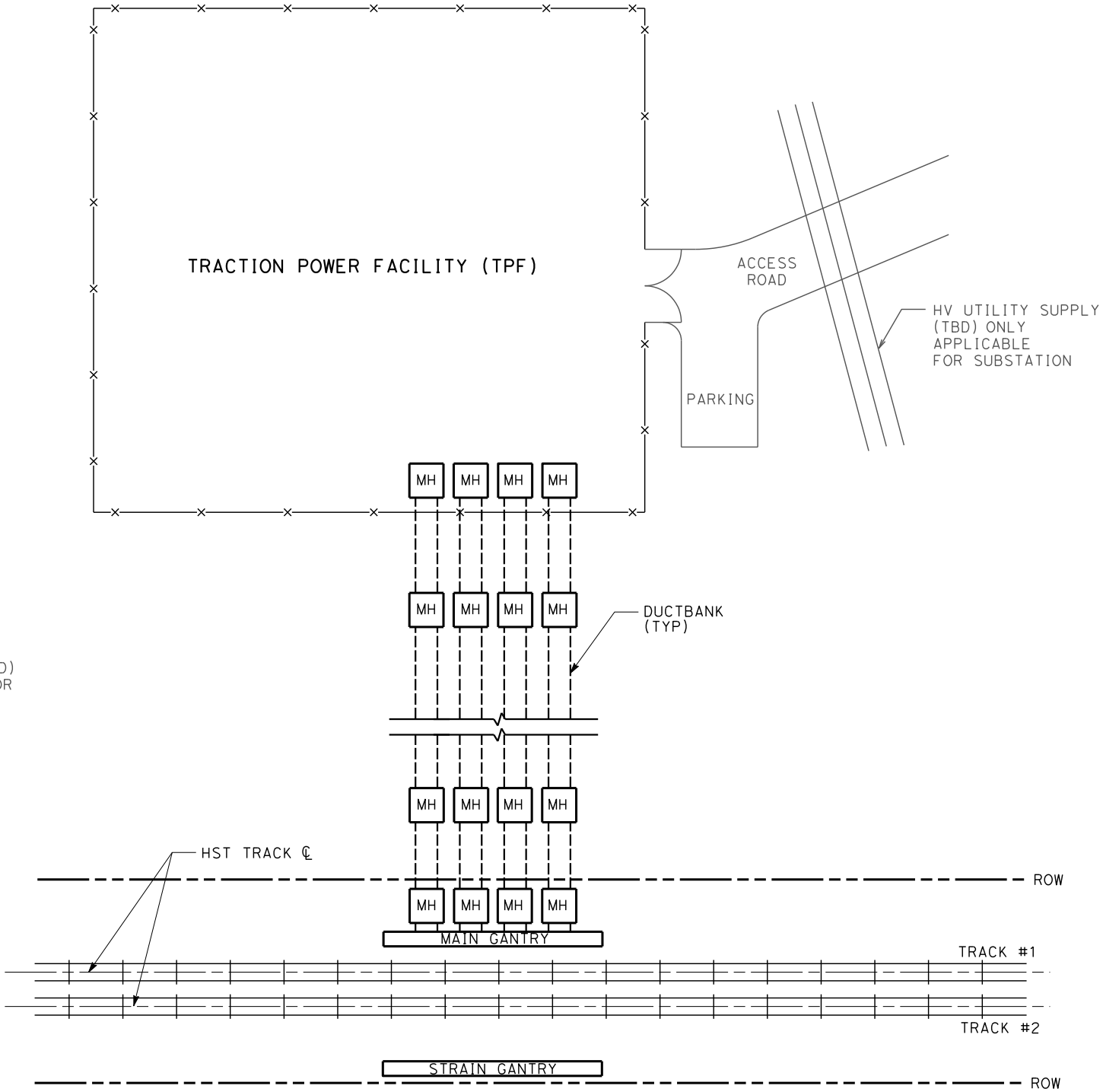
NOTES:

1. THIS DRAWING SHOWS GANTRY ARRANGEMENT FOR AT-GRADE CONFIGURATION FOR TWO ALTERNATIVE OPTIONS:
- 1) TPF LOCATED ADJACENT TO TRACK ALIGNMENT;  
2) TPF LOCATED AWAY FROM TRACK ALIGNMENT;  
ALTERNATIVE 1 IS THE PREFERRED OPTION. ALTERNATIVE 2 MAY BE USED IF ADEQUATE LAND IS NOT AVAILABLE ADJACENT TO RAILROAD ROW.
2. ALTERNATIVE 2 SHALL BE USED FOR TRACK ALIGNMENT ON AERIAL STRUCTURES. SEE "TYPICAL DOUBLE CATENARY FEEDING GANTRY ARRANGEMENT ON AERIAL STRUCTURE" DRAWING.
3. THE SPACING AND NUMBER OF MANHOLES IS INDICATIVE ONLY. ACTUAL LAYOUT WILL DEPEND UPON THE SITE CONDITIONS.
4. THE MAIN GANTRY AND THE STRAIN GANTRY SHALL BE TYPICALLY 4' WIDE AND 40' HIGH.
5. SEE "TYPICAL SINGLE CATENARY FEEDING GANTRY ARRANGEMENT" AND "TYPICAL DOUBLE CATENARY FEEDING GANTRY ARRANGEMENT" DIRECTIVE DRAWINGS FOR GANTRY LOCATION DETAILS.
6. CONCEPTUAL DIMENSIONS FOR MAIN AND STRAIN GANTRY FOUNDATIONS ARE APPROXIMATELY 40' LONG AND 4' WIDE.



ALTERNATIVE #1

TPF LOCATED ADJACENT TO AT-GRADE HST TRACKWAY  
WITH EMBANKMENT HEIGHT (TOR-OG) ≤ 10 FEET



ALTERNATIVE #2

TPF LOCATED AWAY FROM AT-GRADE HST TRACKWAY  
OR EMBANKMENT HEIGHT (TOR-OG) > 10 FEET

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 01/24/2014

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BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE

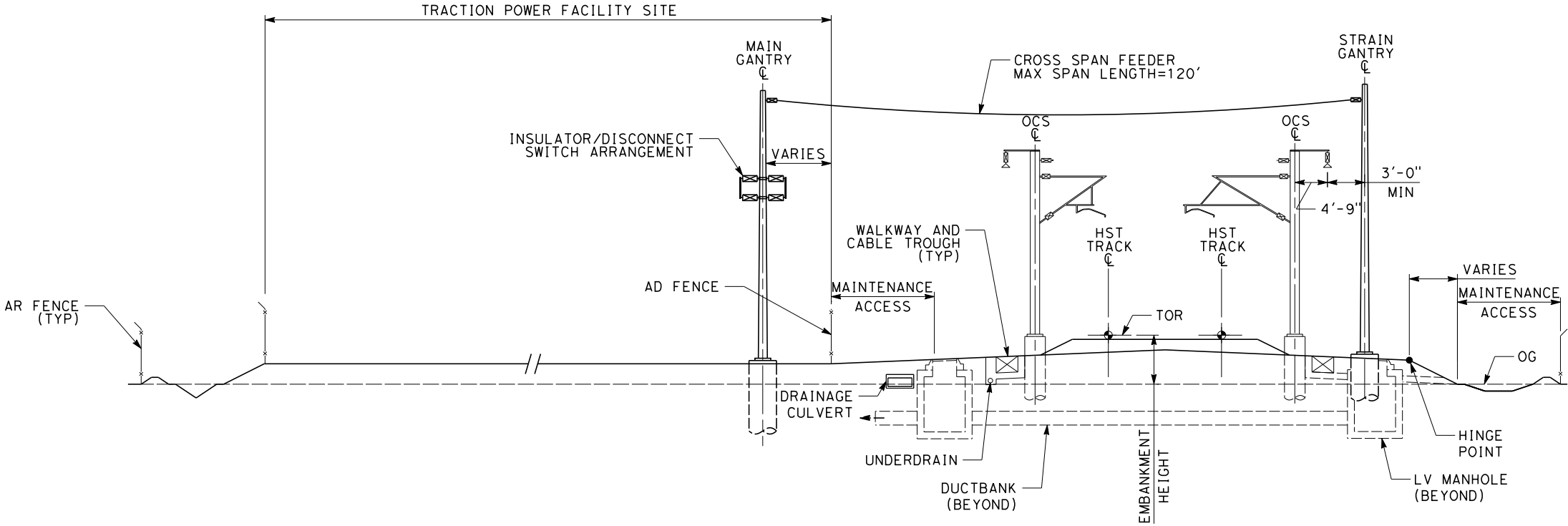
CONCEPTUAL LOCATIONS OF  
TRACTION POWER FACILITIES

CONTRACT NO. 13341
DRAWING NO. DD-TP-D401
SCALE NO SCALE
SHEET NO.

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NOTES:

1. TRACK AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE SYSTEMS SITE.
3. DRAWING SHOWS CROSS SECTION OF TYPICAL CATENARY FEEDING ARRANGEMENT WITH TRACTION POWER FACILITY AND TRACKWAY.
4. FOR TRACTION POWER SITE REQUIREMENTS SEE TRACTION POWER CONCEPTUAL SITE LAYOUT DIRECTIVE DRAWINGS.
5. A LOW VOLTAGE UNDERTRACK DUCTBANK TERMINATING AT LOW VOLTAGE MANHOLES SHALL BE PROVIDED AT EACH SYSTEMS SITE. SEE COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
6. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, SEE CIVIL DIRECTIVE DRAWINGS.
7. FOR SITE DRAINAGE REQUIREMENTS, SEE DRAINAGE DIRECTIVE DRAWINGS.



**TYPICAL SECTION**  
TRACTION POWER FACILITY SITE ADJACENT TO AT-GRADE HST TRACKWAY  
WITH EMBANKMENT HEIGHT (TOR-OG) ≤ 10 FEET

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. PAZ
DRAWN BY V. LAVERDE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

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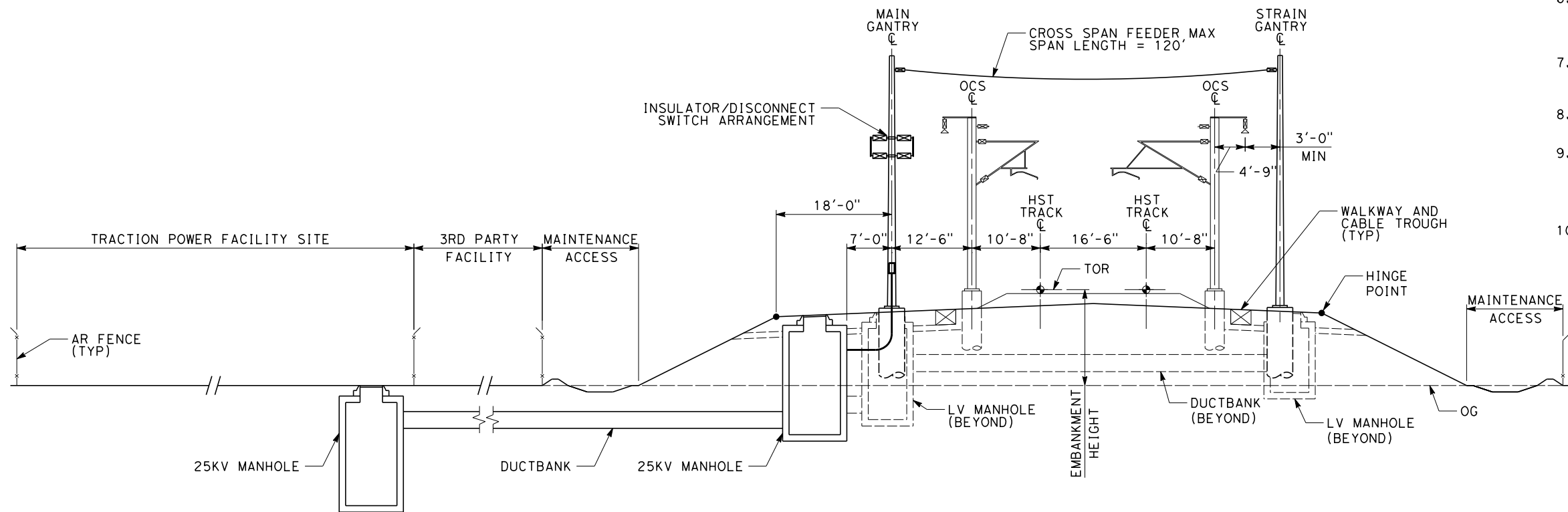
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE**

TYPICAL CATENARY FEEDING GANTRY ARRANGEMENT  
TRACTION POWER FACILITY SITE  
ADJACENT TO TRACKWAY

CONTRACT NO.
DRAWING NO. DD-TP-F101
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TRACTION POWER FACILITY SITE AWAY FROM AT-GRADE HST TRACKWAY OR  
EMBANKMENT HEIGHT (TOR-OG) >10 FEET

**NOTES:**

1. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE SYSTEMS SITE.
2. SYSTEM SITES AWAY FROM TRACKWAY, SEPARATED BY A THIRD-PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA. FOR SITE REQUIREMENTS REFER TO TRACTION POWER SITE REQUIREMENTS.
3. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES PROVIDED AT SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
4. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLE PROVIDED UNDERNEATH 3RD PARTY RIGHT-OF-WAY TO CONNECT TO LOW VOLTAGE UNDERTRACK MANHOLES AND DUCTBANK.
5. FOUR ASSEMBLIES, EACH CONSISTING OF A 25KV UNDERGROUND DUCTBANK WITH 2 25KV MANHOLES, PROVIDED AT EACH TRACTION POWER FACILITY SEPARATED FROM THE TRACKWAY BY THIRD PARTY RIGHT-OF-WAY.
6. FOR TRACTION POWER DUCT BANKS AND MANHOLE DETAILS, REFER TO "TYPICAL 25KV DUCT BANK DETAIL" AND "TYPICAL 25KV MANHOLE DETAIL" DIRECTIVE DRAWINGS.
7. FOR TRACTION POWER SITE REQUIREMENTS, REFER TO TRACTION POWER CONCEPTUAL SITE LAYOUT DIRECTIVE DRAWINGS.
8. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
9. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
10. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

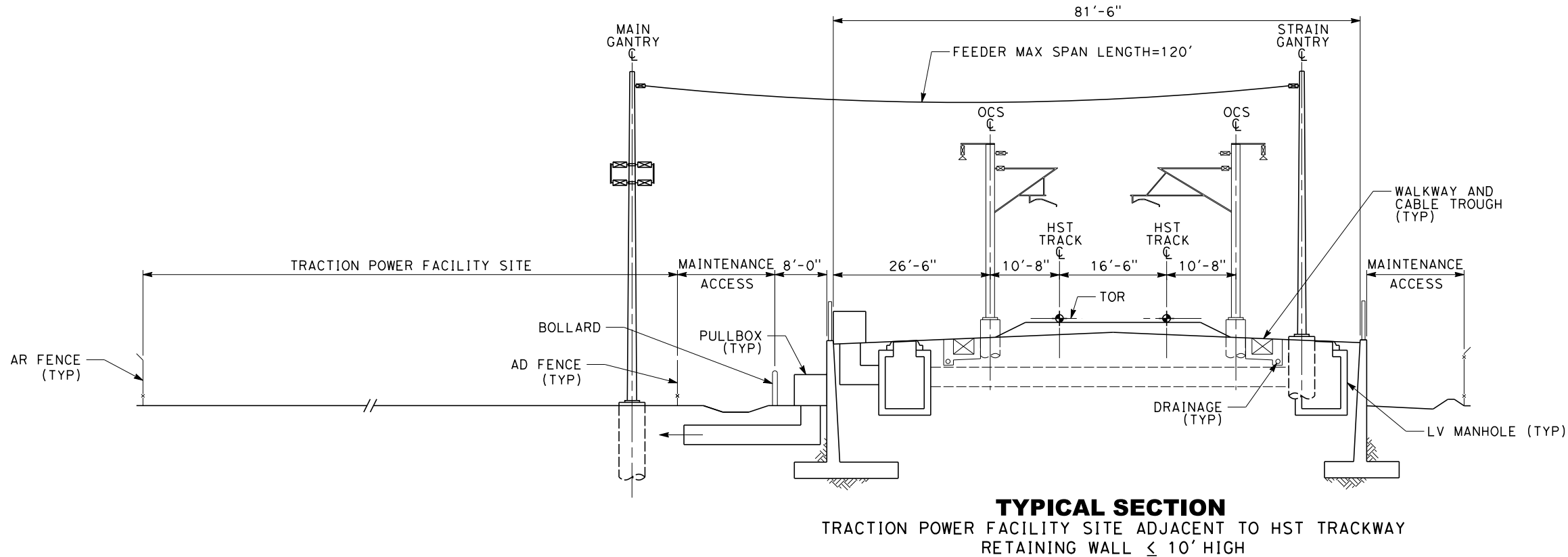
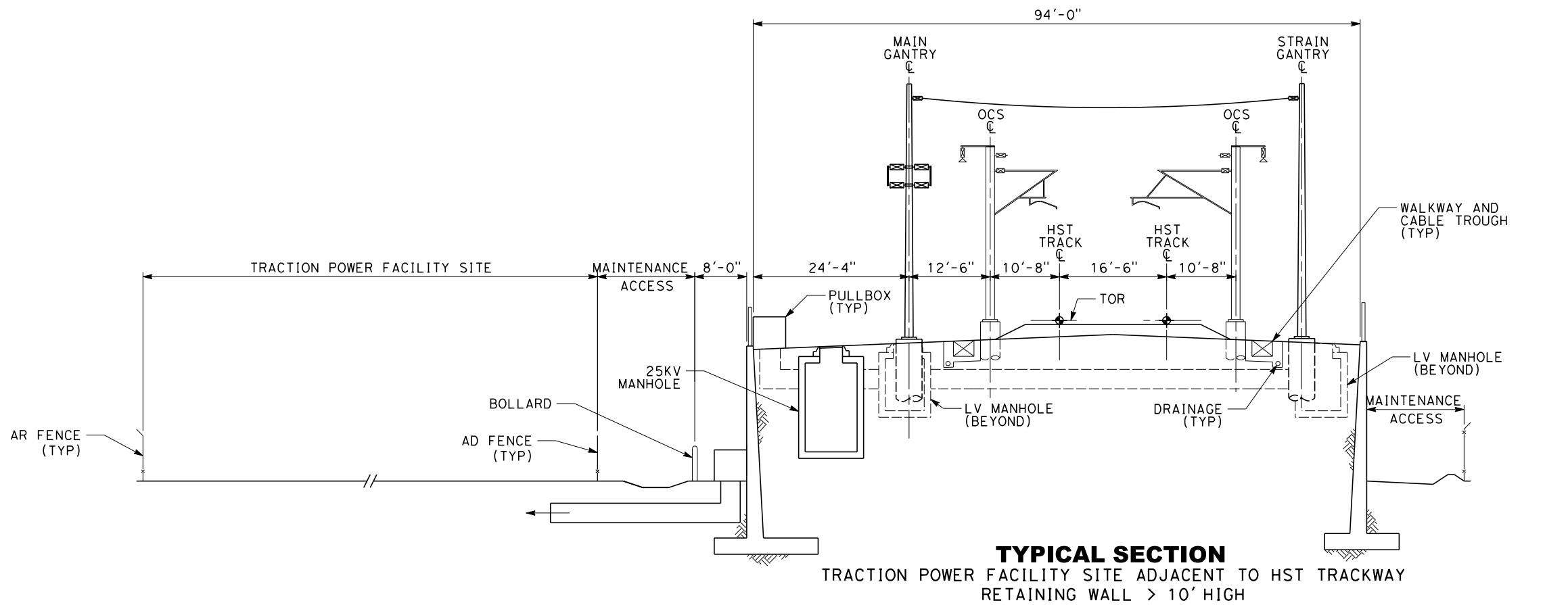
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE**

TYPICAL CATENARY FEEDING GANTRY ARRANGEMENT  
TRACTION POWER FACILITY SITE  
AWAY FROM TRACKWAY

CONTRACT NO.
DRAWING NO. DD-TP-F102
SCALE NO SCALE
SHEET NO.



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- NOTES:**
1. SYSTEM SITES AT RETAINED FILL TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
  2. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS FACILITY SITES.
  3. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE SYSTEMS SITE.
  4. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
  5. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
  6. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.
  7. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES SHALL BE PROVIDED AT SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
  8. FOR TRACTION POWER SITE REQUIREMENTS, REFER TO TRACTION POWER CONCEPTUAL SITE LAYOUT DIRECTIVE DRAWINGS.

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CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

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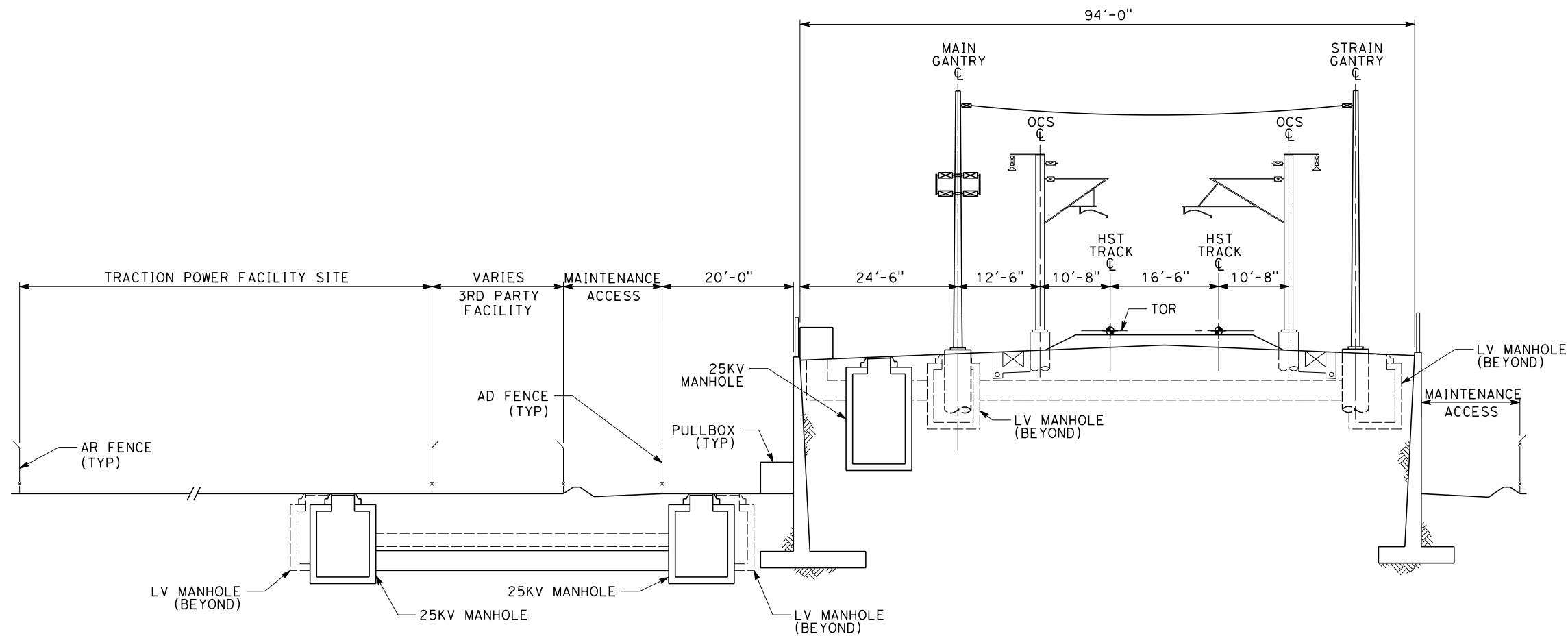
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE**

TYPICAL CATENARY FEEDING ARRANGEMENT  
IN RETAINED-FILL FOR TRACTION POWER FACILITIES  
ADJACENT TO TRACKWAY

CONTRACT NO.
DRAWING NO. DD-TP-F103
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TRACTION POWER FACILITY SITE AWAY FROM RETAINED-FILL HST TRACKWAY

**NOTES:**

1. SYSTEM SITES AT RETAINED FILL TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS FACILITY SITES.
3. SYSTEM SITES AWAY FROM TRACKWAY SEPARATED BY A THIRD-PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
4. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE SYSTEMS SITE.
5. FOR TRACTION POWER DUCT BANKS AND MANHOLE DETAILS, REFER TO "TYPICAL 25KV DUCT BANK DETAIL AND TYPICAL 25KV MANHOLE DETAIL" DIRECTIVE DRAWINGS.
6. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES SHALL BE PROVIDED AT SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
7. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLE TO BE PROVIDED UNDERNEATH 3RD PARTY RIGHT-OF-WAY.
8. FOUR ASSEMBLIES, EACH CONSISTING OF A 25KV UNDERGROUND DUCTBANKS WITH 2 25KV MANHOLES, PROVIDED AT EACH TRACTION POWER FACILITY SEPARATED FROM THE TRACKWAY BY THIRD PARTY RIGHT-OF-WAY.
9. FOR TRACTION POWER SITE REQUIREMENTS, REFER TO TRACTION POWER CONCEPTUAL SITE LAYOUT DIRECTIVE DRAWINGS.
10. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
11. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
12. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

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DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

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BRINCKERHOFF**



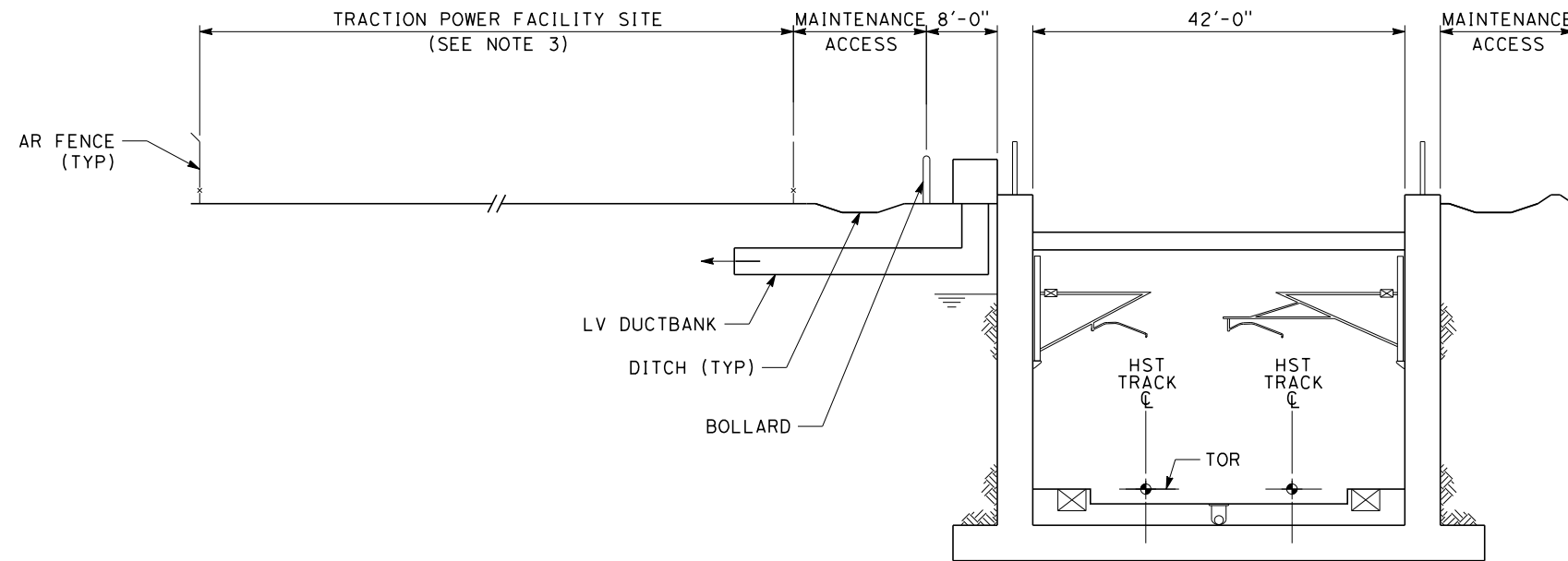
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE**

TYPICAL CATENARY FEEDING ARRANGEMENT  
FOR TRACTION POWER FACILITIES  
IN RETAINED-FILL AWAY FROM TRACKWAY

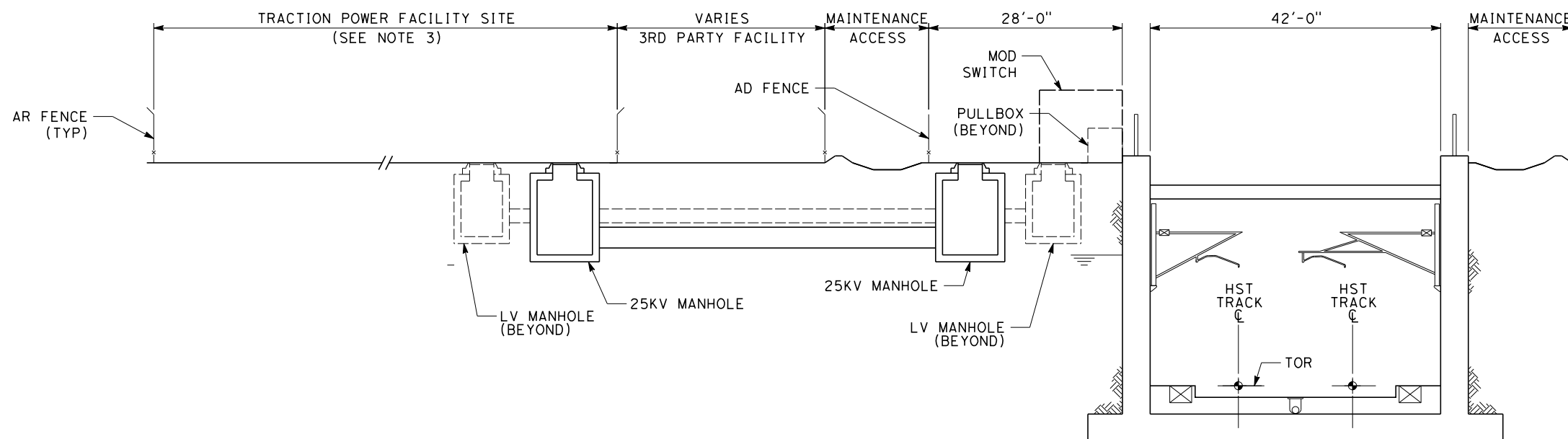
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### TYPICAL SECTION

TRACTION POWER FACILITY SITE ADJACENT TO TRENCH HST TRACKWAY



### TYPICAL SECTION

TRACTION POWER FACILITY SITE AWAY FROM TRENCH HST TRACKWAY

### NOTES:

1. SYSTEM SITES AT TRENCH TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS FACILITY SITES.
3. SYSTEM SITES AWAY FROM TRACKWAY SEPARATED BY A THIRD PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
4. TYPICAL CROSS-SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE SYSTEMS SITE.
5. FOR TRACTION POWER DUCT BANKS AND MANHOLE DETAILS, REFER TO "TYPICAL 25KV DUCT BANK DETAIL" AND "TYPICAL 25KV MANHOLE DETAIL" DIRECTIVE DRAWINGS.
6. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLE SHALL BE PROVIDED UNDERNEATH THIRD PARTY RIGHT-OF-WAY TO CONNECT TO LOW VOLTAGE UNDERTRACK MANHOLES AND DUCTBANK. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
7. FOUR ASSEMBLIES EACH CONSISTING OF 25KV UNDERGROUND DUCTBANKS WITH 2 25KV MANHOLES PROVIDED AT EACH TRACTION POWER FACILITY SEPARATED FROM THE TRACKWAY BY THIRD PARTY RIGHT-OF-WAY.
8. FOR TRACTION POWER SITE REQUIREMENTS, REFER TO TRACTION POWER CONCEPTUAL SITE LAYOUT DIRECTIVE DRAWINGS.
9. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
10. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
11. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

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DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 8/29/2014

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**CALIFORNIA**  
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TRACTION POWER DIRECTIVE**

SYSTEMS SITE  
TRACTION POWER FACILITY  
TRENCH

CONTRACT NO.
DRAWING NO. DD-TP-F105
SCALE NO SCALE
SHEET NO.



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DESIGNED BY M. PAZ
DRAWN BY V. HUANTE
CHECKED BY V. SIBAL
IN CHARGE B. BANKS
DATE 01/24/2014

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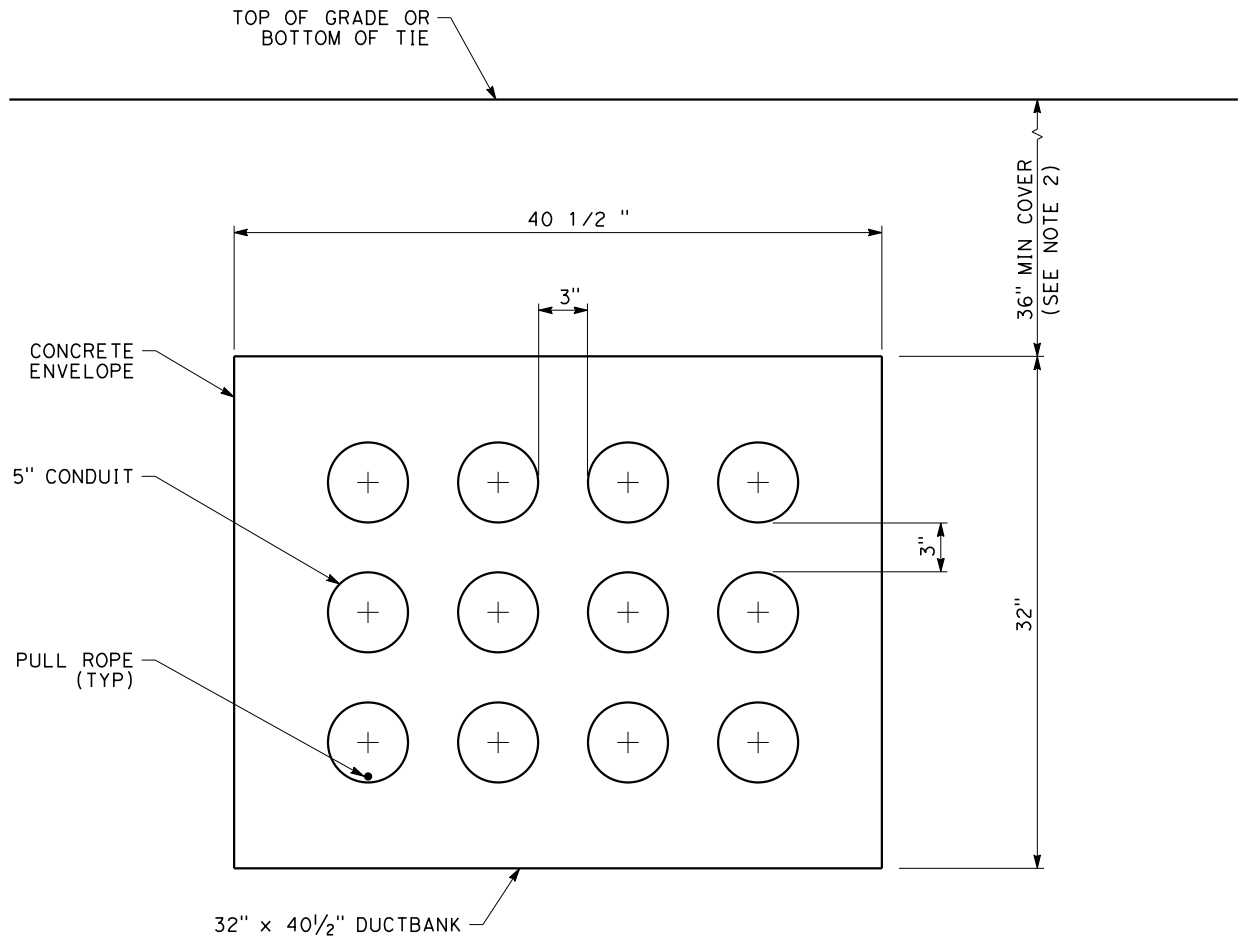


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CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE

TYPICAL 25KV DUCT BANK DETAIL

CONTRACT NO.
DRAWING NO. DD-TP-N101
SCALE NO SCALE
SHEET NO.

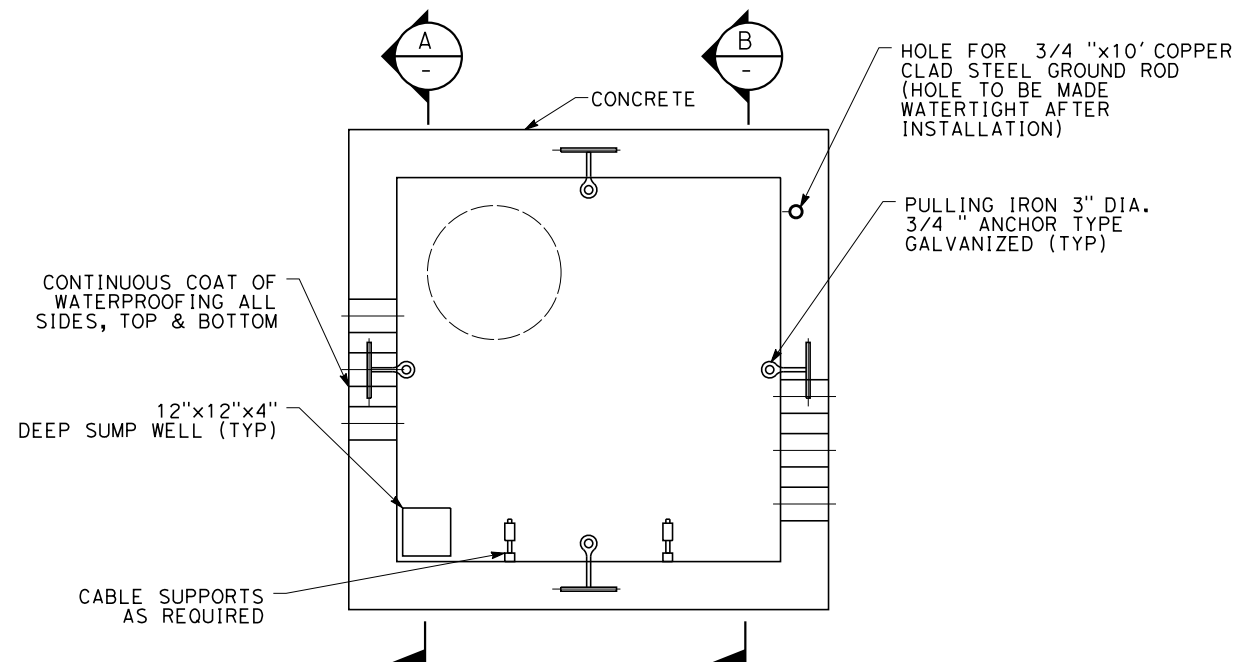


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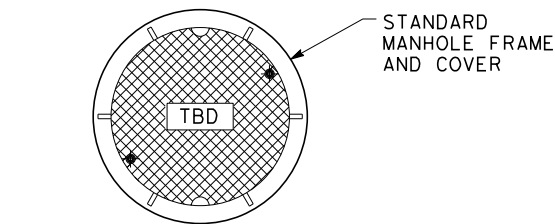
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NOTES:

1. THIS DRAWING SHOWS TYPICAL DUCT BANK DETAILS FOR 5" CONDUIT FOR ILLUSTRATION PURPOSES ONLY. DESIGN THE DUCT BANK TO SITE AND EQUIPMENT SPECIFIC REQUIREMENTS CONFORMING TO RELEVANT CODES, SPECIFICATIONS AND DESIGN CRITERIA.
2. A 36" MINIMUM COVER SHALL BE MAINTAINED FROM TOP OF GRADE TO TOP OF DUCT BANK, WHEN NOT GOING UNDER RAILROAD TRACK, AND A MINIMUM 5'-6" UNDER RAILROAD TRACKS FROM THE BOTTOM OF TIE.
3. THE CONDUIT MATERIAL SHALL BE PVC OR FRE.
4. 25KV CATENARY FEEDER, 25KV NEGATIVE FEEDER, TRACTION RETURN CABLING, HV/MV CABLES FOR FACILITY/AUXILIARY POWER SUPPLY, AND LOW VOLTAGE CABLES (AUXILIARY POWER SUPPLY, COMMUNICATIONS, SIGNALING AND TRAIN CONTROL) MAY BE ROUTED IN THE SAME DUCTBANK BUT IN SEPARATE CONDUITS.



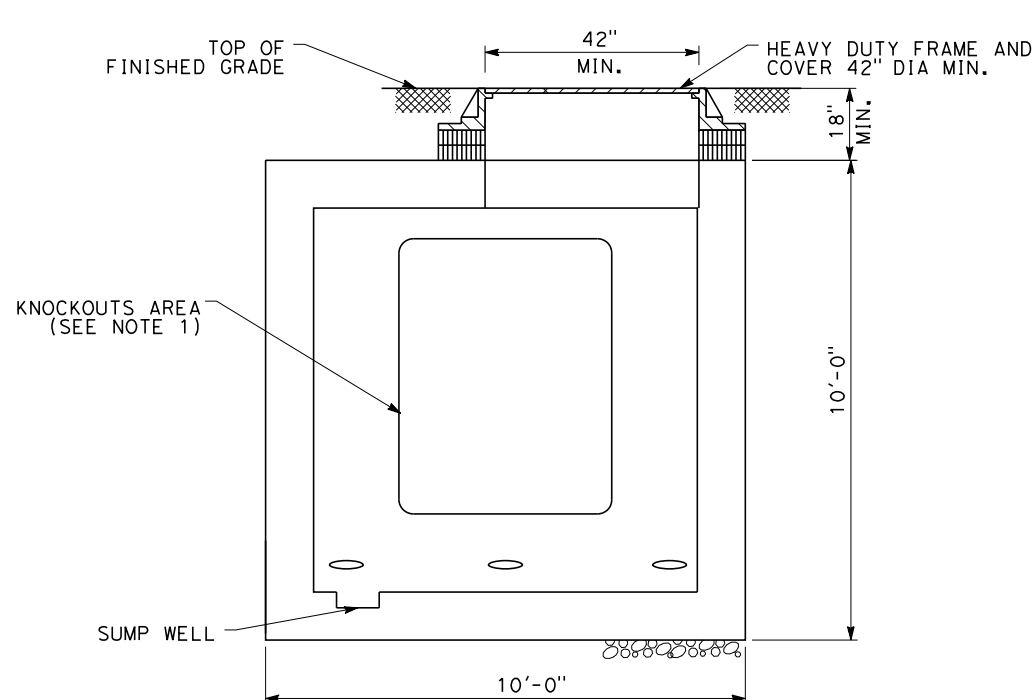
**PLAN**  
TYPICAL PRECAST ELECTRIC MANHOLE



**PLAN**  
ELECTRIC MANHOLE FRAME  
AND COVER DETAIL

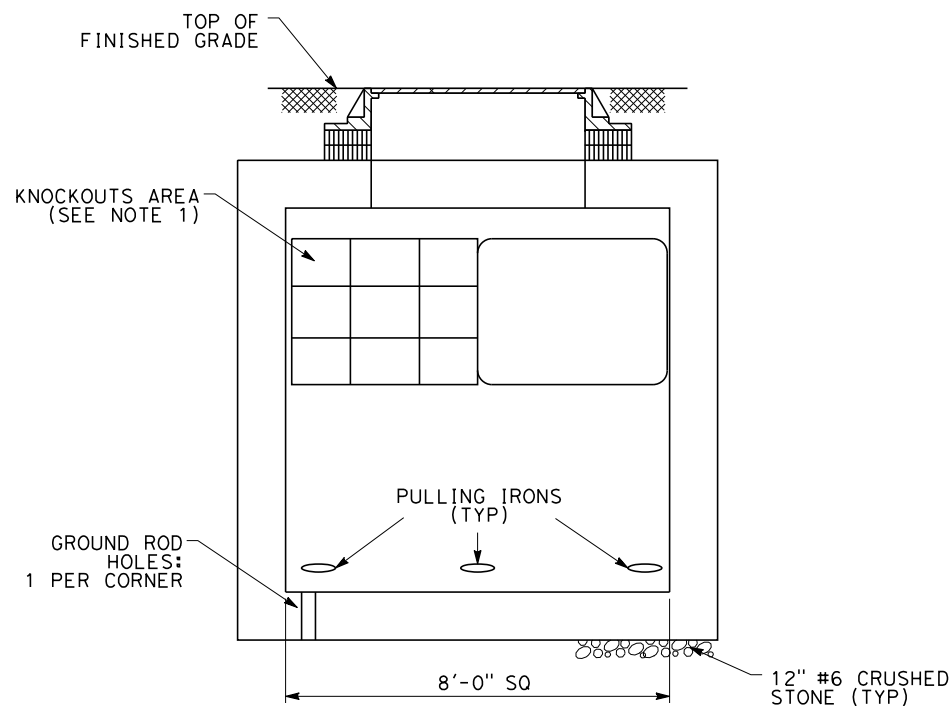
**NOTES:**

1. THIS DRAWING SHOWS TYPICAL DUCT BANK KNOCKOUTS IN A PRECAST MANHOLE. EXACT DETAILS TO BE WORKED OUT AT DETAILED DESIGN LEVEL.
2. ALL TRACTION POWER MANHOLES SHALL BE TYPICALLY 10'-0" L X 10'-0" W X 10'-0" DEEP AND BE WATERTIGHT WITH SILICON SEALING COMPOUND, OR APPROVED EQUAL.
3. THE MANHOLE FRAME SHALL BE GROUTED TO THE ROOF SLAB.
4. THICKNESS OF MANHOLE WALL SHALL BE 8" MINIMUM.
5. APPROVED CABLE RACK ARMS TO BE INSTALLED TO ACCOMMODATE CABLE, MINIMUM 2 RACKS PER WALL (TYP).
6. PULLING HOOKS SHALL BE GALVANIZED STEEL, SUPPLIED AND CAST INTO WALLS BY PRECASTER, AND ANCHORED BEHIND REINFORCEMENT. QUANTITY AND LOCATION TO SUIT.
7. CONNECT ALL METALLIC PARTS, FRAME, PULLING HOOKS, ETC., TO THE TRACTION POWER FACILITY GROUND GRID OR GROUND ROD.
8. PROVIDE FOR CONNECTION TO A PORTABLE PUMP TO REMOVE ACCUMULATED WATER FROM THE MANHOLE OR OTHER SITE SPECIFIC DRAINAGE SYSTEM.
9. 25KV CATENARY FEEDER, 25KV NEGATIVE FEEDER, TRACTION RETURN CABLING, HV/MV CABLES FOR FACILITY/AUXILIARY POWER SUPPLY, AND LOW VOLTAGE CABLES (AUXILIARY POWER SUPPLY, COMMUNICATIONS, SIGNALING AND TRAIN CONTROL) SHALL BE ROUTED IN SEPARATE MANHOLES.



TYPICAL PRECAST ELECTRIC MANHOLE

**SECTION A**  
NO SCALE



TYPICAL PRECAST ELECTRIC MANHOLE

**SECTION B**  
NO SCALE

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REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	M. PAZ
DRAWN BY	V. HUANTE
CHECKED BY	V. SIBAL
IN CHARGE	B. BANKS
DATE	8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

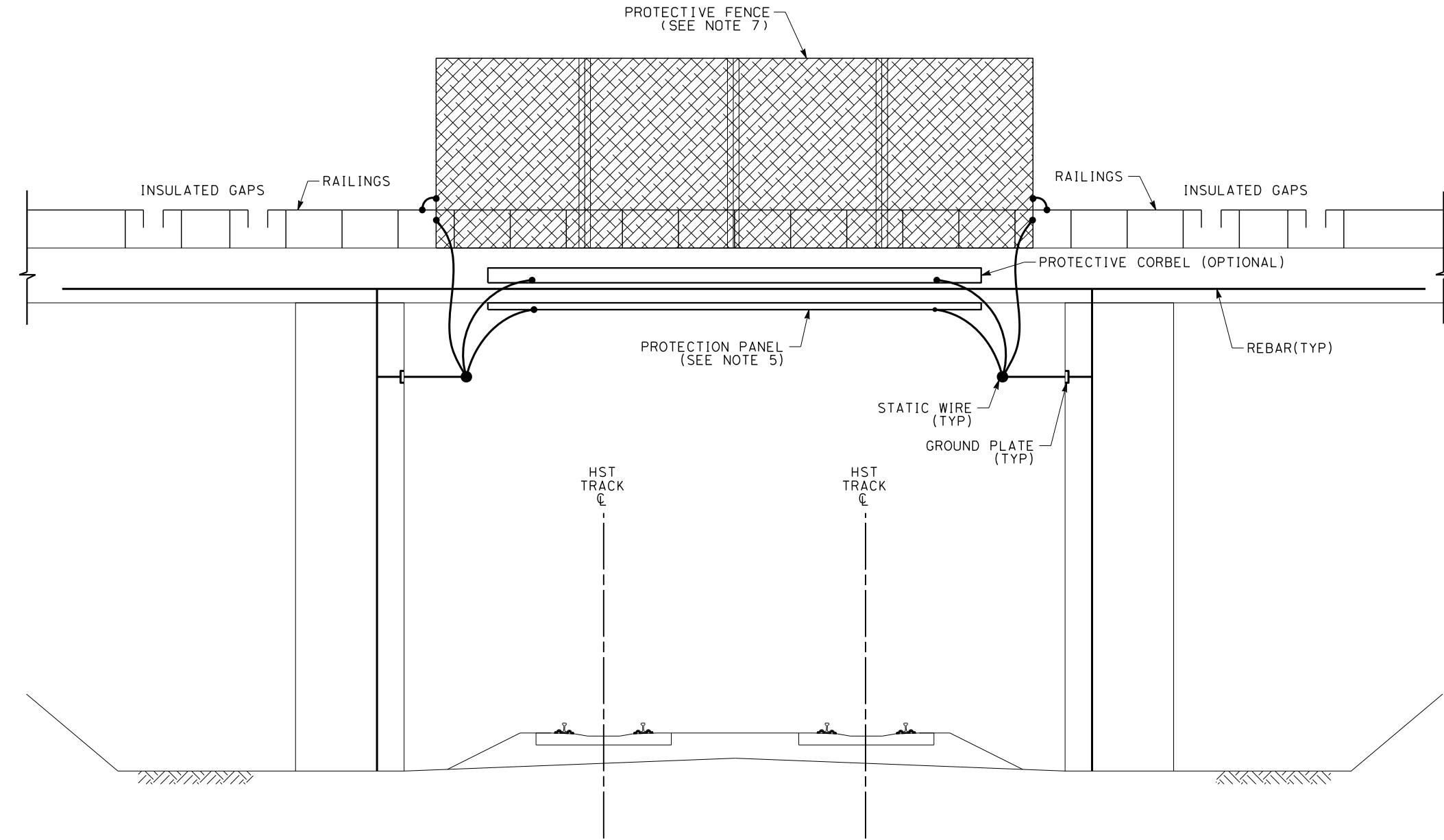
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRACTION POWER DIRECTIVE**

TYPICAL 25KV MANHOLE DETAILS

CONTRACT NO.
DRAWING NO. DD-TP-N111
SCALE NO SCALE
SHEET NO.

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

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**TYPICAL OVERHEAD STRUCTURE GROUNDING AND BONDING**

**NOTES:**

1. TRACK, STRUCTURES, AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
2. SMALL METALLIC ITEMS, SUCH AS RAILING, FENCE ETC, BEYOND THE STEP AND TOUCH POTENTIAL LIMIT NEED NOT BE GROUNDED. THE STEP AND TOUCH POTENTIAL EXISTS WITHIN 8' OF A STANDING TRAIN, 8' FROM ANY ELECTRICALLY CONTINUOUS BONDED FENCE, AND 8' FROM ANY METALLIC ITEM BONDED TO STATIC WIRE.
3. GROUNDING AND BONDING DETAILS DESIGN SHALL BE COORDINATED WITH OVERPASS STRUCTURE DESIGNER.
4. OVERHEAD BRIDGE GROUNDING AND BONDING DETAILS SHOWN IN DRAWING ARE GENERIC IN NATURE. THE OCS DESIGNER SHALL PROVIDE DETAILED ASSEMBLIES AND COMPONENTS THAT MEET THE REQUIREMENT.
5. GALVANIZED STEEL STRIP OR ANGLE SECTION SHALL BE INSTALLED ABOVE THE OVERHEAD LINE AT EACH BRIDGE FACE, IF THE BRIDGE SOFFIT IS WITHIN THE PANTOGRAPH ZONE. WHEN THE VERTICAL CLEARANCE BETWEEN OCS CONDUCTORS AND CONCRETE OVERPASSES IS LESS THAN 3 FEET, PROTECTION PANELS (FLASH PLATES) SHALL BE INSTALLED ABOVE THE OCS, ATTACHED TO THE UNDERSIDE OF THE STRUCTURE, AND INTERCONNECTED TO THE STATIC WIRE AT NOT LESS THAN TWO LOCATIONS.
6. THE GROUND PLATE SHALL BE NO LESS THAN 6" X 6" IN DIMENSION.
7. SEE OVERHEAD CONTACT SYSTEM AND TRACTION POWER RETURN SYSTEM AND CIVIL DESIGN CRITERIA CHAPTERS FOR PROTECTIVE FENCE CRITERIA.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY J. LAU
DRAWN BY V. HUANTE
CHECKED BY M. HSIAO
IN CHARGE B. BANKS
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**

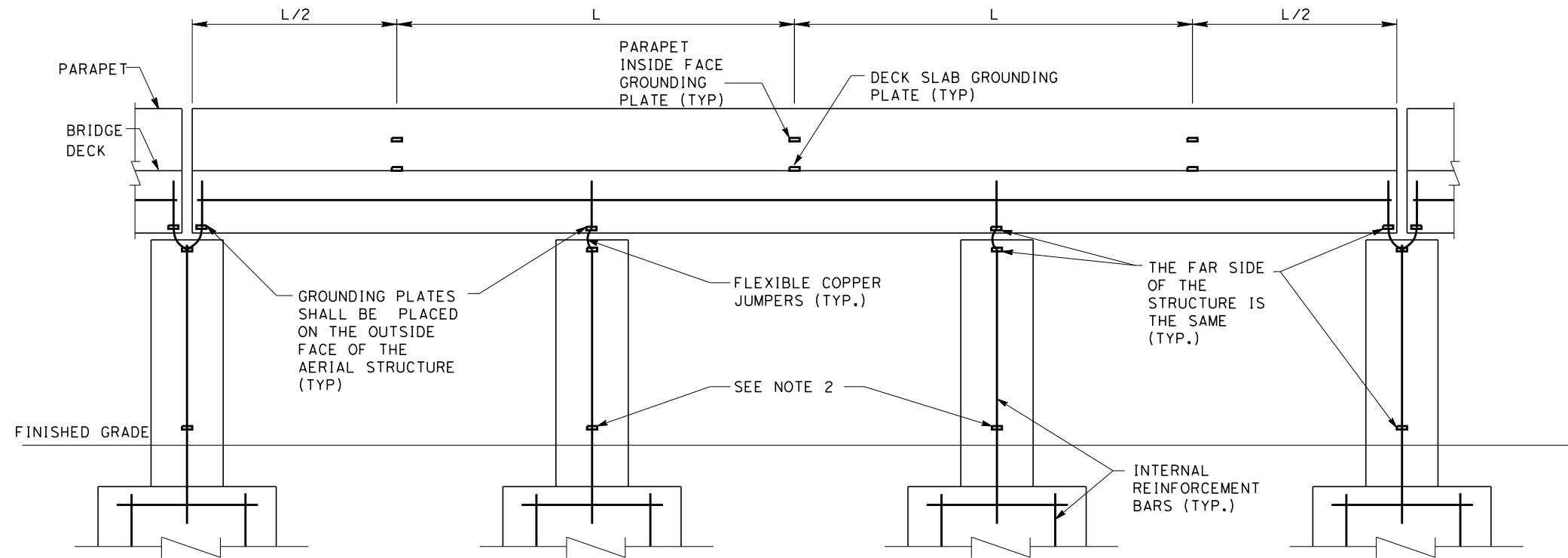


**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
OVERHEAD CONTACT SYSTEM DIRECTIVE**

TYPICAL GROUNDING AND BONDING ARRANGEMENT  
OVERHEAD BRIDGE STRUCTURE

CONTRACT NO. 13341
DRAWING NO. DD-OC-2046
SCALE NO SCALE
SHEET NO.

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### AERIAL STRUCTURE WITH CONTINUOUS BEAM

#### NOTES:

1. FOR SUPERSTRUCTURE UNITS THAT ARE GREATER THAN 150 FEET IN LENGTH, THE DECK SLAB AND PARAPET GROUNDING PLATES SHALL BE POSITINED AT SPACING (L) = 150 FEET.
2. THE LOCATION OF THE LOWER COLUMN GROUNDING PLATE SHALL BE DETERMINED BY THE CONTRACTOR WITH CONSIDERATION FOR DESIGN LIFE AND RAMS.
3. IF COPPER BRAIDS ARE USED AS THE FLEXIBLE COPPER JUMPERS A STUD SUITABLE FOR CONNECTING THE BRAID LUG MUST BE EXOTHERMICALLY WELDED TO EACH GROUNDING PLATE.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY J. LAU
DRAWN BY V. HUANTE
CHECKED BY M. HSIAO
IN CHARGE R. SCHMEDES
DATE 08/29/2015

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

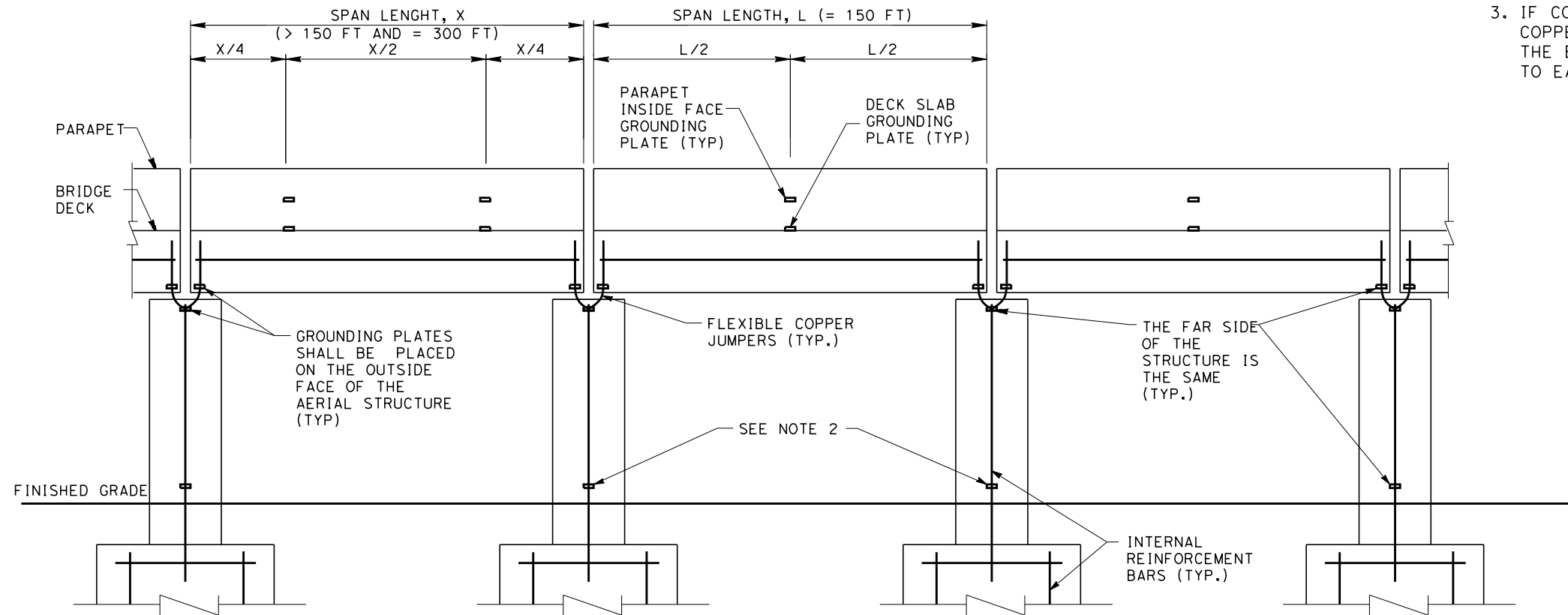
#### CALIFORNIA HIGH-SPEED TRAIN PROJECT OVERHEAD CONTACT SYSTEM DIRECTIVE

GROUNDING AND BONDING ARRANGEMENT  
AERIAL STRUCTURE WITH CONTINUOUS BEAM

CONTRACT NO.
DRAWING NO. DD-OC-2050
SCALE NO SCALE
SHEET NO.



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**AERIAL STRUCTURE WITH SIMPLY SUPPORTED BEAMS**

- NOTES:**
- 1. FOR SUPERSTRUCTURE UNITS THAT ARE GREATER THAN 150 FEET IN LENGTH, THE DECK SLAB AND PARAPET GROUNDING PLATES SHALL BE POSITINED AT SPACING (L) = 150 FEET.
  - 2. THE LOCATION OF THE LOWER COLUMN GROUNDING PLATE SHALL BE DETERMINED BY THE CONTRACTOR WITH CONSIDERATION FOR DESIGN LIFE AND RAMS.
  - 3. IF COPPER BRAIDS ARE USED AS THE FLEXIBLE COPPER JUMPERS A STUD SUITABLE FOR CONNECTING THE BRAID LUG MUST BE EXOTHERMICALLY WELDED TO EACH GROUNDING PLATE.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY J. LAU
DRAWN BY V. HUANTE
CHECKED BY M. HSIAO
IN CHARGE R. SCHMEDES
DATE 08/29/2015

**PARSONS  
BRINCKERHOFF**



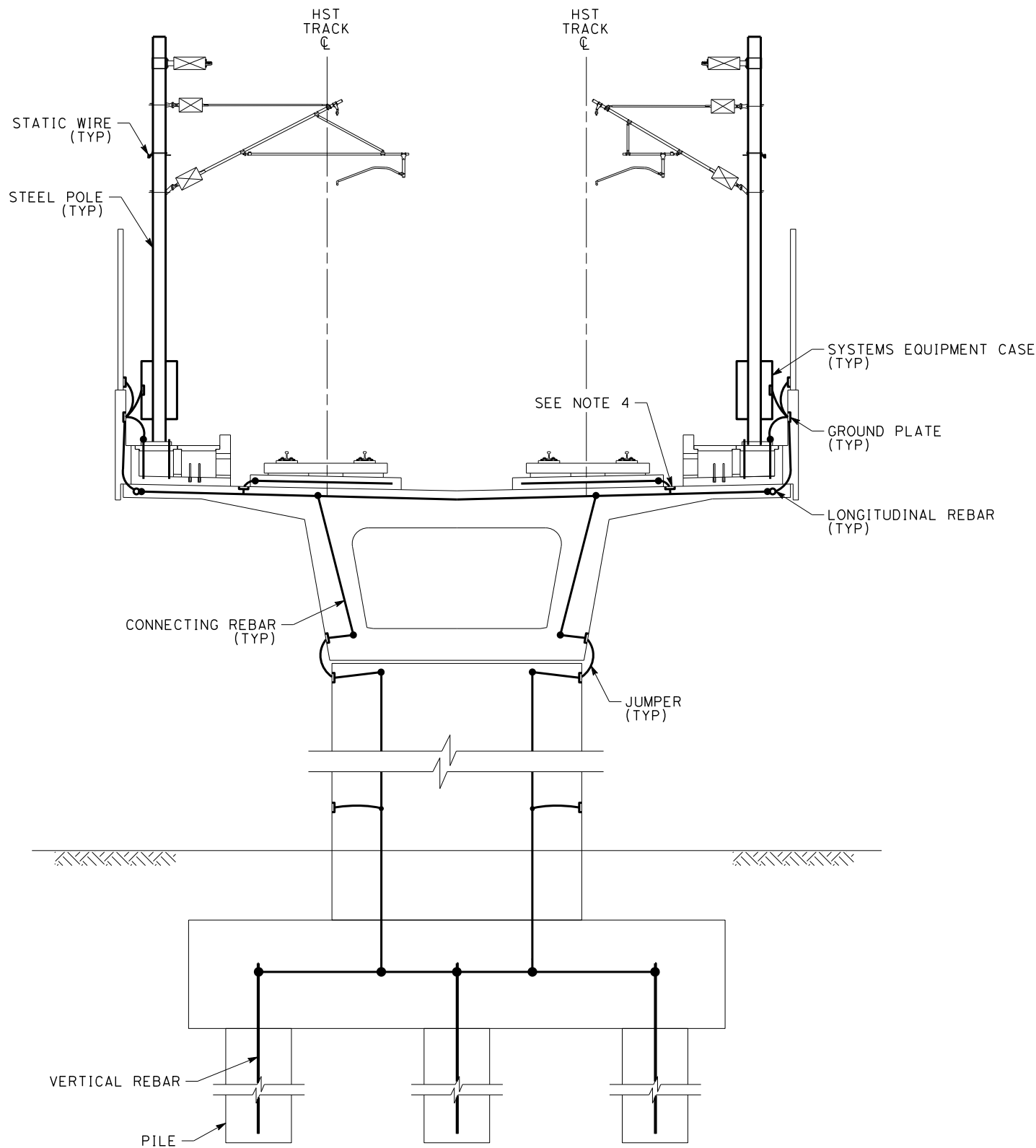
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
OVERHEAD CONTACT SYSTEM DIRECTIVE**

GROUNDING AND BONDING ARRANGEMENT  
AERIAL STRUCTURE WITH SIMPLY SUPPORTED BEAMS

CONTRACT NO.
DRAWING NO. DD-OC-2051
SCALE NO SCALE
SHEET NO.

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**TYPICAL OCS GROUNDING AND BONDING**  
AT AERIAL STRUCTURE

- NOTES:**
1. TRACK, STRUCTURES, AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. GROUNDING AND BONDING DETAIL DESIGN SHALL BE COORDINATED WITH AERIAL STRUCTURE DESIGNER.
  3. THE GROUNDING AND BONDING FOR THE EMERGENCY WALKWAY AREA AND OTHER PUBLICLY ACCESSIBLE AREAS SHALL BE DESIGNED TO AVOID INADMISSIBLE TOUCH AND STEP VOLTAGES AND ALSO MEET SIGNALING OPERATION REQUIREMENTS.
  4. FOR LOCATIONS OF THE GROUND PLATES, SEE GROUNDING AND BONDING DESIGN CRITERIA FOR DETAIL.
  5. THE GROUND PLATES ON THE AERIAL STRUCTURE SLAB SHALL BE PLACED BETWEEN THE EDGE OF THE TRACK SLAB AND DERAILMENT WALL.
  6. THE GROUND PLATE SHALL BE NO LESS THAN 6"X6" IN DIMENSION.
  7. INDIVIDUAL CONCRETE TIES DO NOT NEED TO BE BONDED TO THE TRACTION POWER RETURN SYSTEM. STEEL REINFORCEMENT IN PRECAST CONCRETE PANELS FOR DIRECT FIXATION TRACK SHALL BE BONDED AND CONNECTED TO THE TRACTION POWER RETURN SYSTEM.
  8. STEEL REINFORCED CONCRETE PARAPETS AND CONDUCTIVE SCREEN, NOISE, WIND OR SAFETY BARRIERS OR RAILINGS SHALL BE BONDED TO THE TRACTION POWER RETURN SYSTEM.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY J. LAU
DRAWN BY V. HUANTE
CHECKED BY M. HSIAO
IN CHARGE B. BANKS
DATE 01/24/2014

**PARSONS  
BRINCKERHOFF**



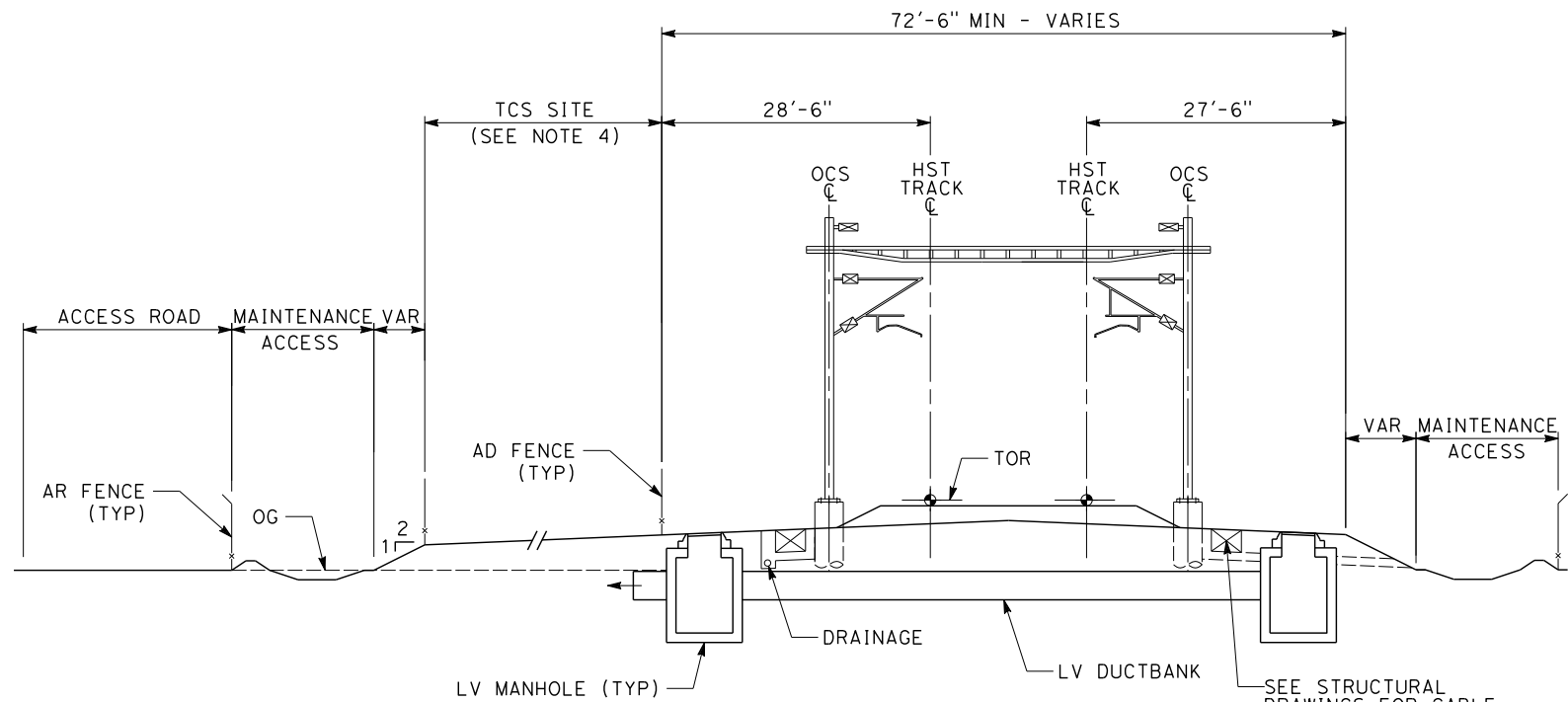
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
OVERHEAD CONTACT SYSTEM DIRECTIVE**

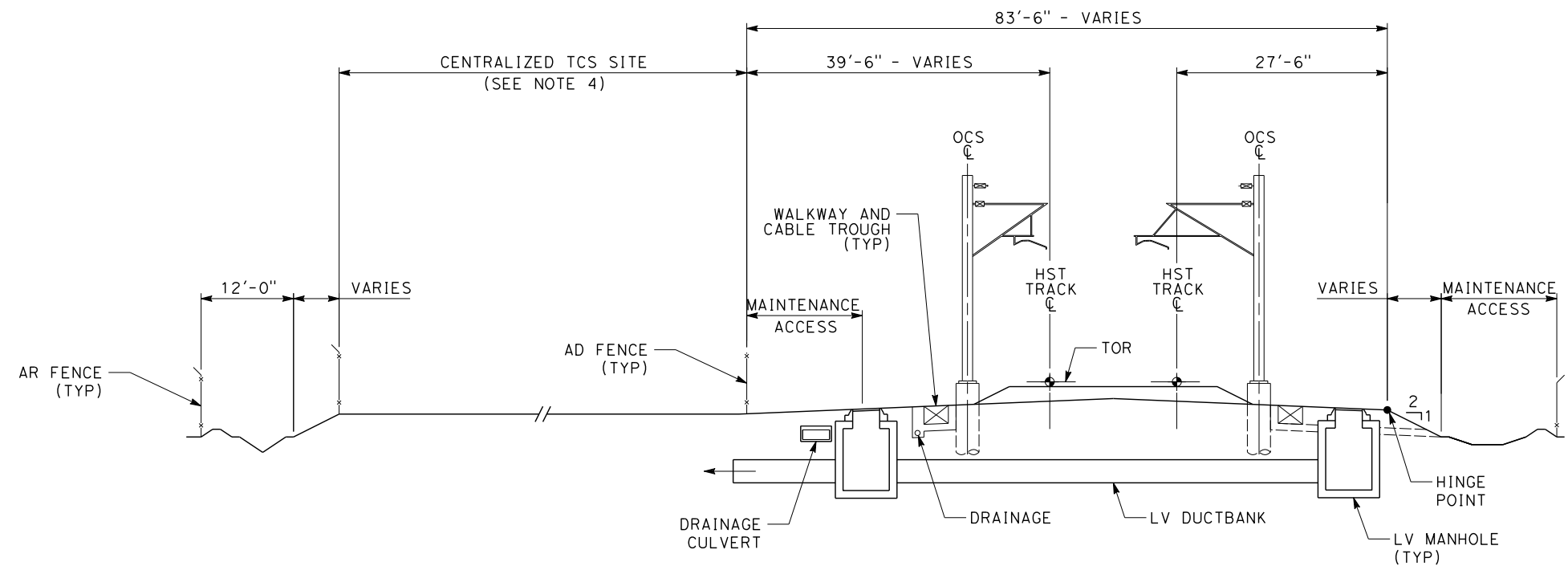
TYPICAL GROUNDING AND BONDING ARRANGEMENT  
AERIAL STRUCTURE

CONTRACT NO.
DRAWING NO. DD-OC-2047
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TCS SITE ADJACENT TO AT-GRADE HST TRACKWAY



**TYPICAL SECTION**  
CENTRALIZED TCS SITE ADJACENT TO AT-GRADE HST TRACKWAY

**NOTES:**

1. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE CENTRALIZED TRAIN CONTROL SITE OR FOR THE LONGITUDINAL DISTANCE BETWEEN FURTHEST TRAIN CONTROL SITES AT AN INTERLOCKING.
2. FOR TRAIN CONTROL SITE REQUIREMENTS REFER TO TYPICAL TRAIN CONTROL SITES LAYOUT DIRECTIVE DRAWINGS.
3. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES PROVIDED AT EACH SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
4. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
5. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
6. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUFTIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



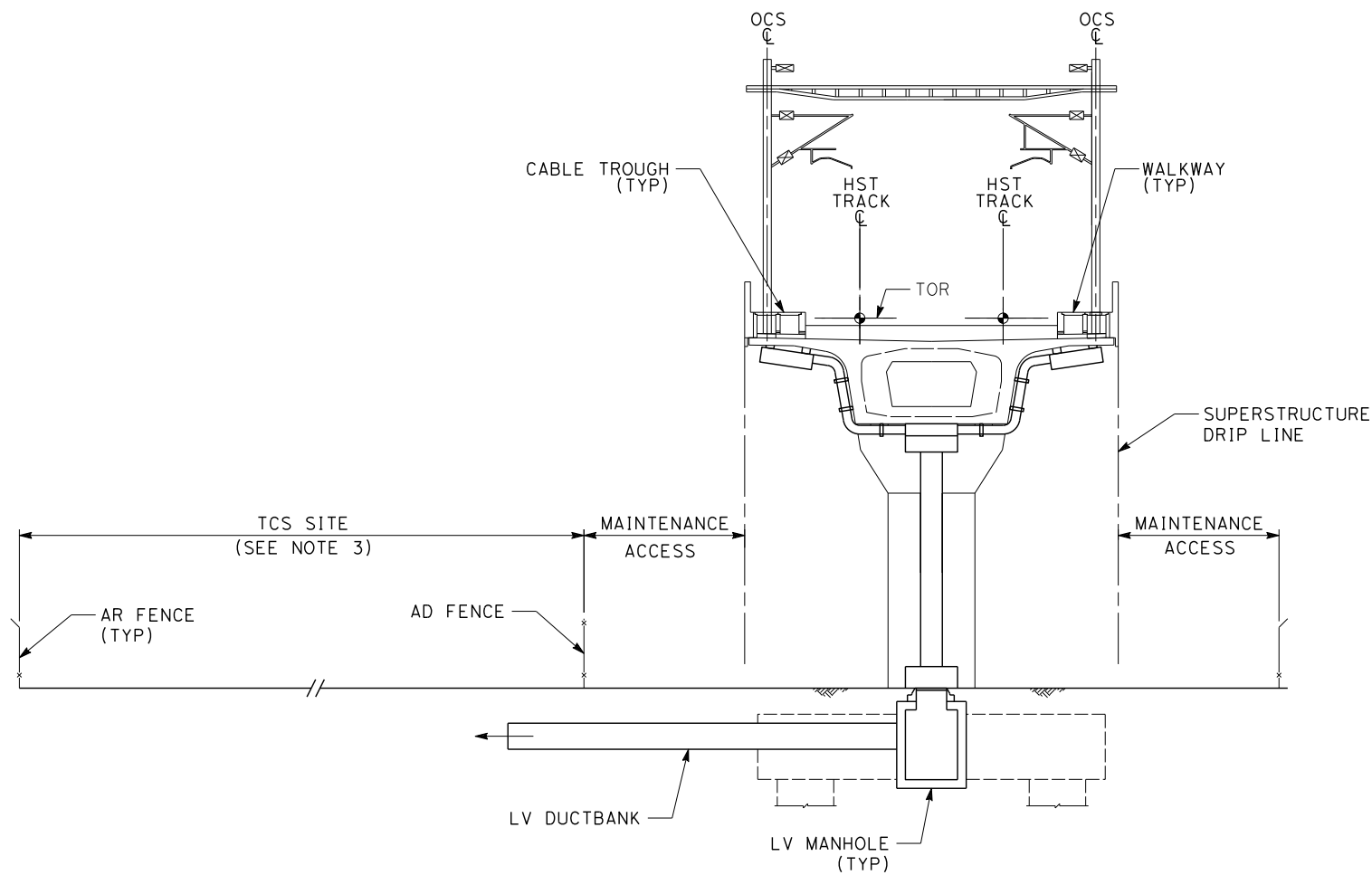
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE**

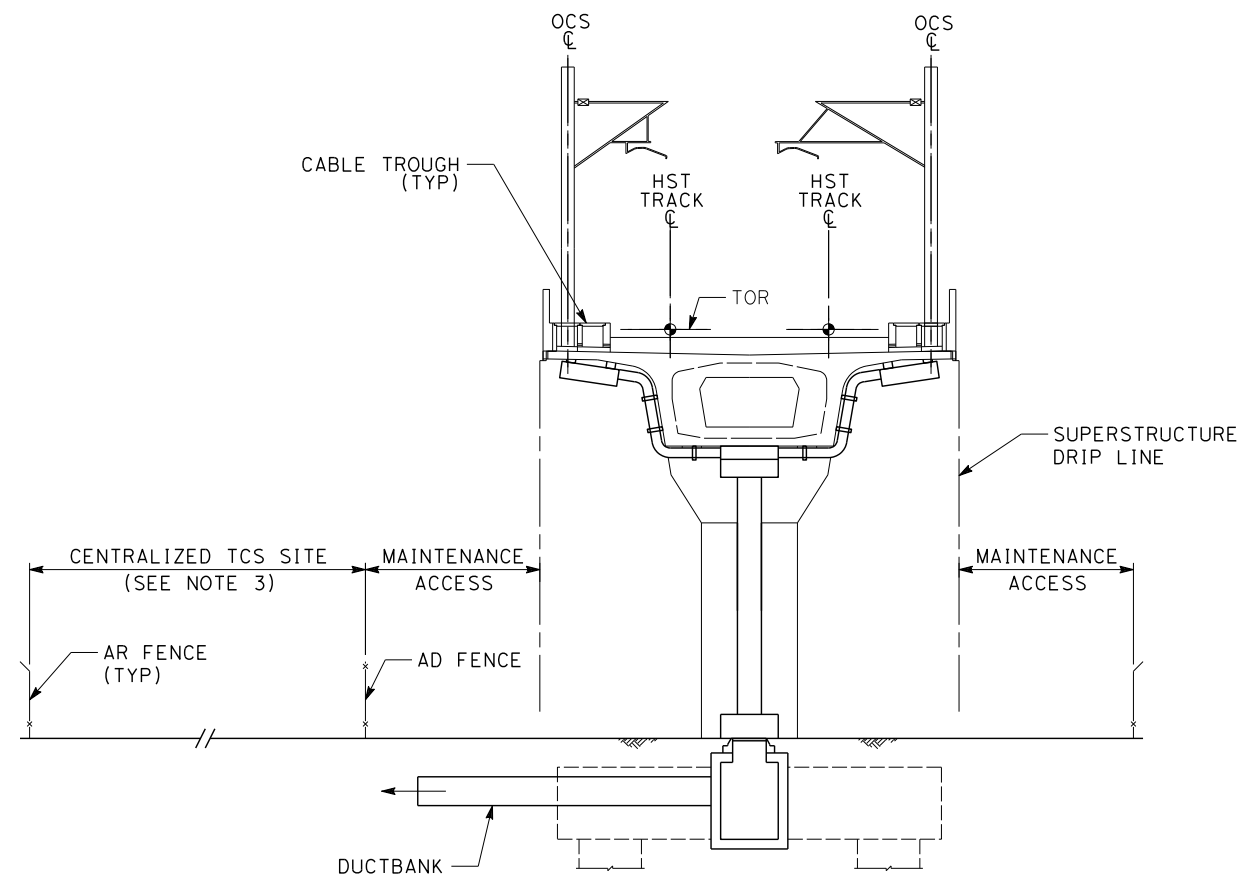
SYSTEMS SITE  
TCS  
AT GRADE

CONTRACT NO.
DRAWING NO. DD-TC-100
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TCS SITE AT AERIAL TRACKWAY



**TYPICAL SECTION**  
CENTRALIZED TCS SITE AT AERIAL TRACKWAY

**NOTES:**

1. SYSTEM SITES AT AERIAL TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
3. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
4. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.
5. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE CENTRALIZED TRAIN CONTROL SITE OR FOR THE LONGITUDINAL DISTANCE BETWEEN FURTHEST TRAIN CONTROL SITES AT AN INTERLOCKING.
6. FOR TRAIN CONTROL SITE REQUIREMENTS REFER TO TYPICAL TRAIN CONTROL SITES LAYOUT DIRECTIVE DRAWINGS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUFTIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



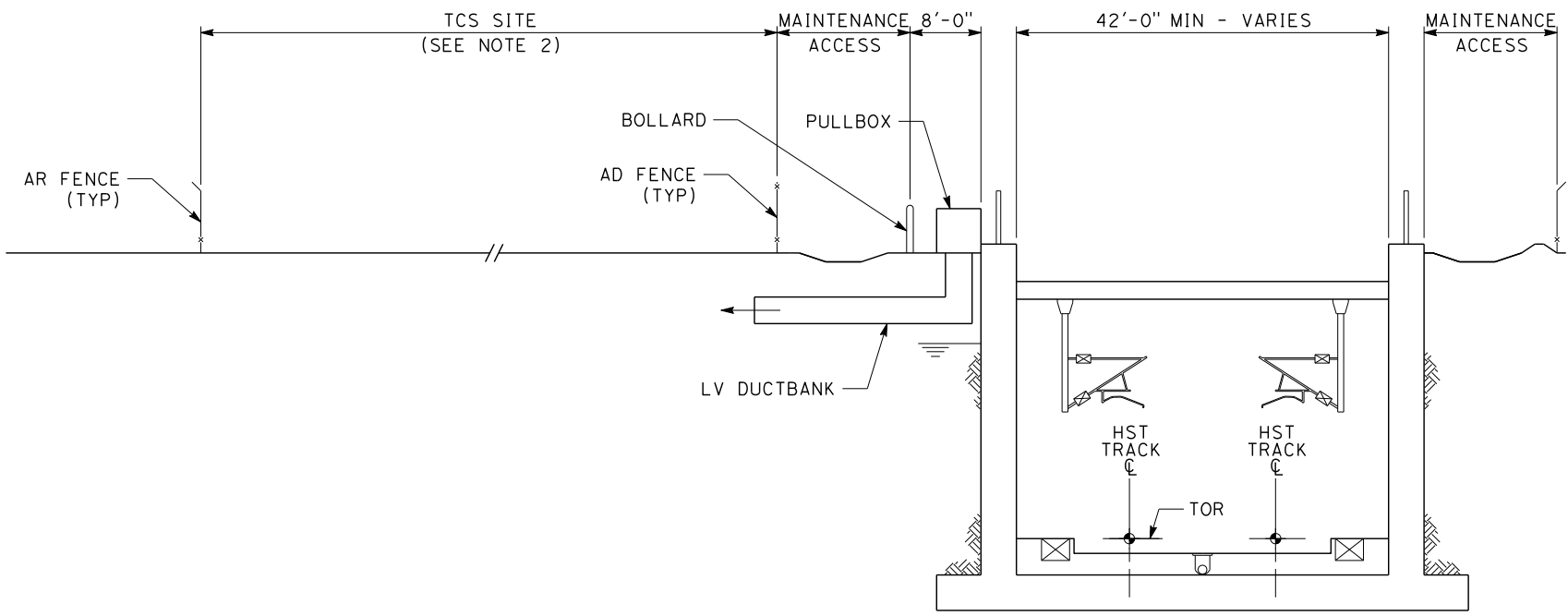
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE**

SYSTEMS SITE  
TCS  
AERIAL

CONTRACT NO.
DRAWING NO. DD-TC-101
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TCS SITE ADJACENT TO HST TRACKWAY  
TRENCH

**NOTES:**

1. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE TRAIN CONTROL SITE D OR FOR THE LONGITUDINAL DISTANCE BETWEEN FURTHEST TRAIN CONTROL SITES AT AN INTERLOCKING.
2. FOR TRAIN CONTROL SITE REQUIREMENTS REFER TO TYPICAL TRAIN CONTROL SITES LAYOUT DIRECTIVE DRAWINGS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUFTIC
DRAWN BY V. HUANTE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



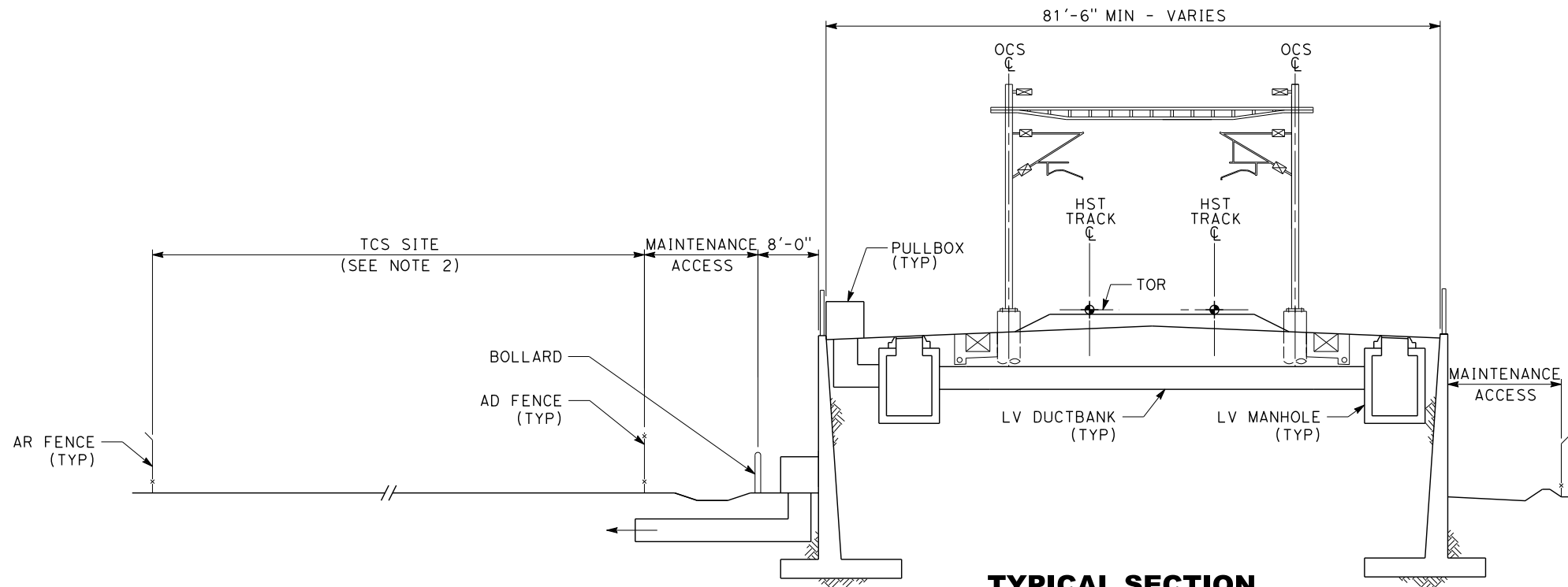
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
AUTOMATIC TRAIN DIRECTIVE**

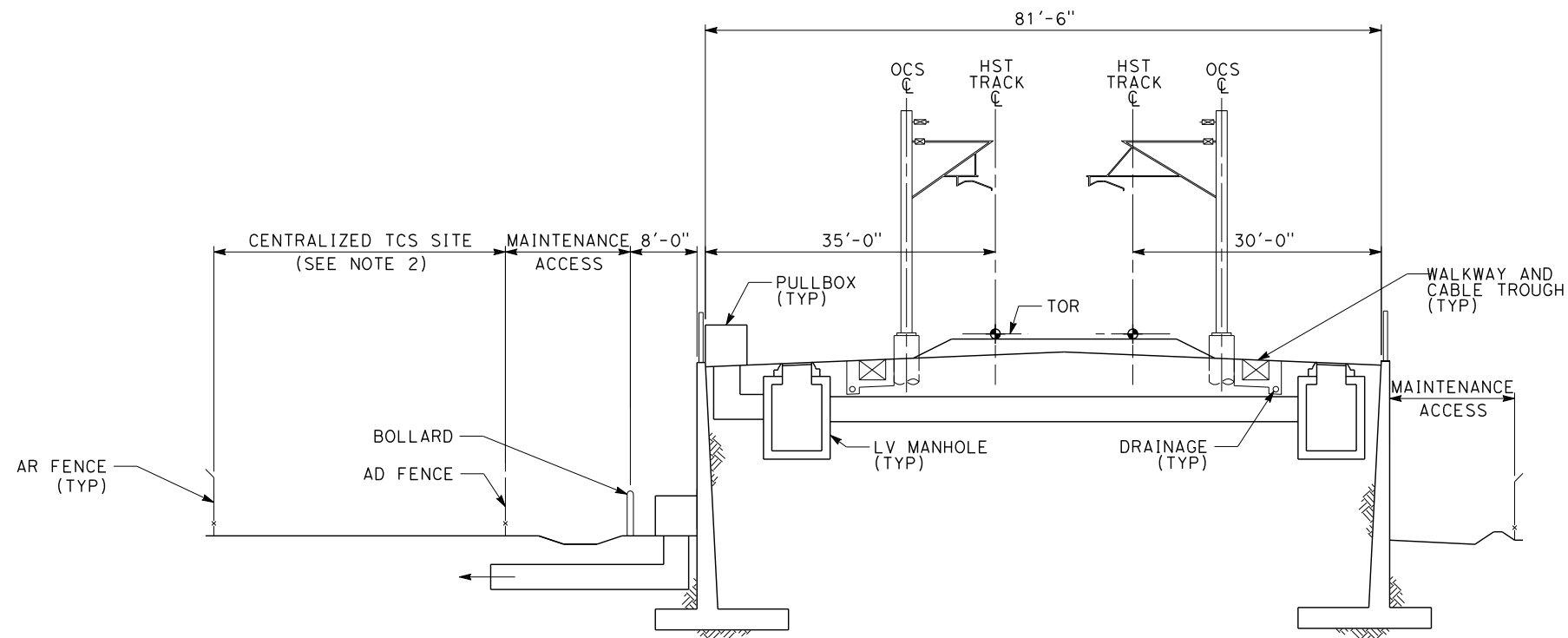
SYSTEMS SITE  
TCS  
TRENCH

CONTRACT NO.
DRAWING NO. DD-TC-102
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
TCS SITE ADJACENT TO HST TRACKWAY  
RETAINING WALL



**TYPICAL SECTION**  
CENTRALIZED TCS SITE ADJACENT TO HST TRACKWAY  
RETAINING WALL

**NOTES:**

1. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS SITES.
2. TYPICAL CROSS SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR MINIMUM LENGTH EQUAL TO THE LONGITUDINAL WIDTH OF THE CENTRALIZED TRAIN CONTROL SITE OR FOR THE LONGITUDINAL DISTANCE BETWEEN FURTHEST AUTOMATIC TRAIN CONTROL SITES AT AN INTERLOCKING.
3. FOR TRAIN CONTROL SYSTEM SITE REQUIREMENTS REFER TO TYPICAL TRAIN CONTROL SITES LAYOUT DIRECTIVE DRAWINGS.
4. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES PROVIDED AT EACH SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
5. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
6. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
7. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUFTIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



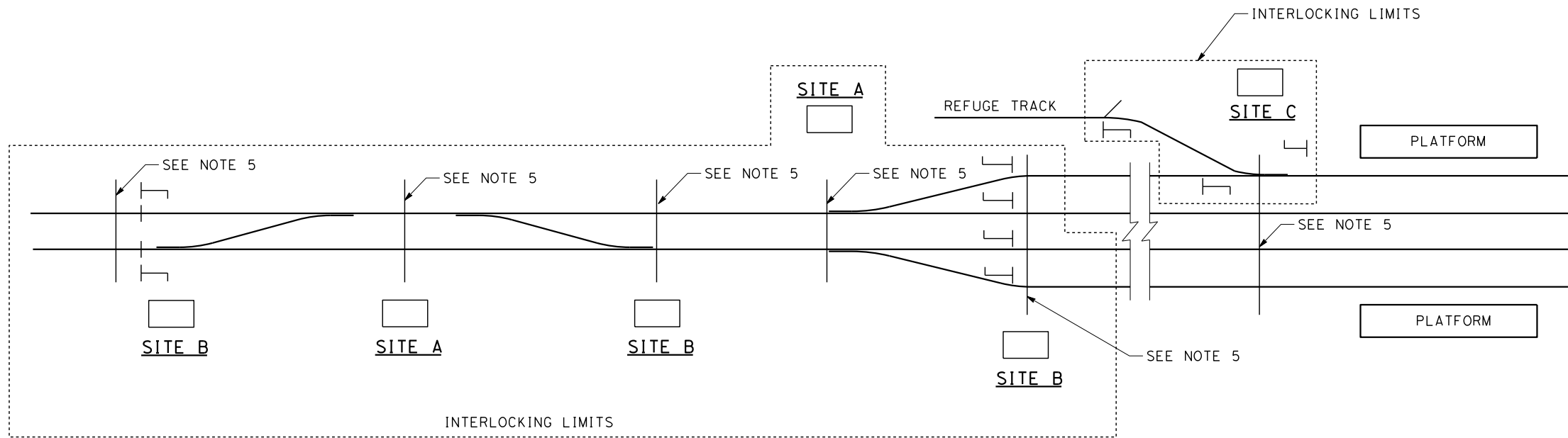
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL SYSTEM DIRECTIVE**

SYSTEMS SITE  
TCS  
RETAINED FILL

CONTRACT NO.
DRAWING NO. DD-TC-103
SCALE NO SCALE
SHEET NO.

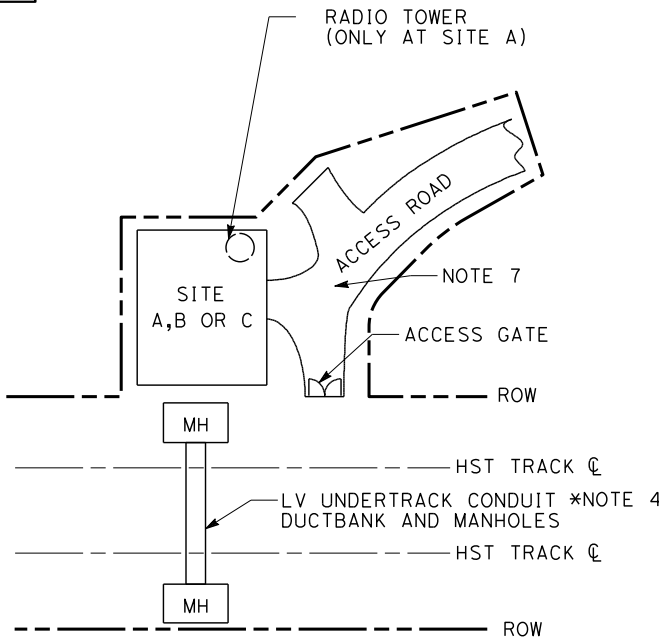
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PLAN

NOTES:

1. SITES A AND B MAY BE LOCATED ON EITHER SIDE OF THE TRACK.
2. WHERE POSSIBLE, FOR SITES A AND B, ALTERNATIVES SHALL BE PROVIDED ON THE OPPOSITE SIDE OF THE TRACK.
3. SITE A WILL ACCOMMODATE TRAIN CONTROL SYSTEM EQUIPMENT, COMMUNICATIONS SYSTEM EQUIPMENT WITH THE RADIO TOWER, AND WAYSIDE POWER CONTROL (WPC) EQUIPMENT.
4. AN ACCESS ROAD AND AN ACCESS GATE SHALL BE PROVIDED FOR EACH SITE PER THE CIVIL DESIGN CRITERIA.
5. AN ASSEMBLY, CONSISTING OF A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES, SHALL BE PROVIDED AT EACH TRAIN CONTROL SITE. REFER TO COMMUNICATIONS DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE DETAIL REQUIREMENTS.
6. FOR NUMBER OF CONDUITS REFER TO COMMUNICATIONS DESIGN CRITERIA AND DRAWING "TYPICAL CROSS SECTION SYSTEMS LOW-VOLTAGE CONDUIT DUCTBANK".
7. ACCESS ROADS AND ACCESS GATES ARE SHOWN FOR INFORMATION ONLY. REFER TO CIVIL DESIGN CRITERIA FOR ACCESS ROADS AND ACCESS GATES DETAIL REQUIREMENTS.



SITE A, B OR C

WITH LOW-VOLTAGE UNDERTRACK CONDUIT DUCTBANK, ACCESS ROADS AND GATES

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUF TIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

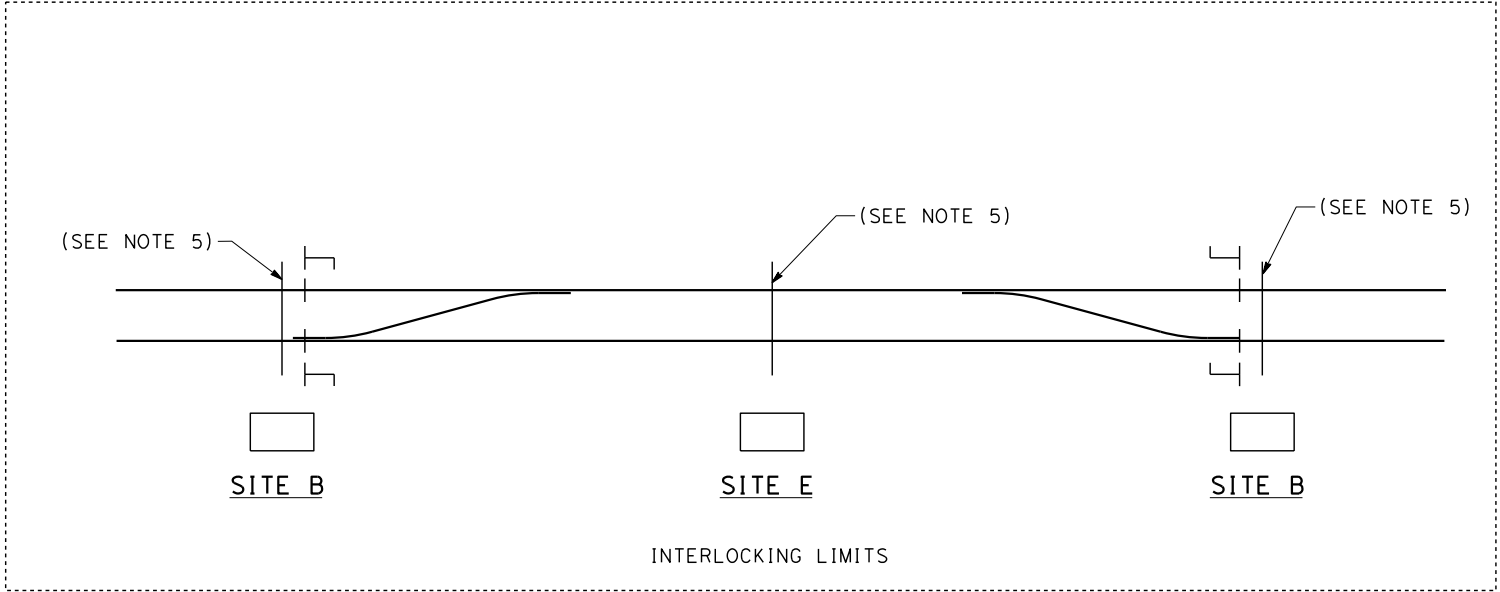
CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE

TYPICAL TCS SITES  
LAYOUT AT STATION AND INTERLOCKINGS

CONTRACT NO.
DRAWING NO. DD-TC-200
SCALE NO SCALE
SHEET NO.

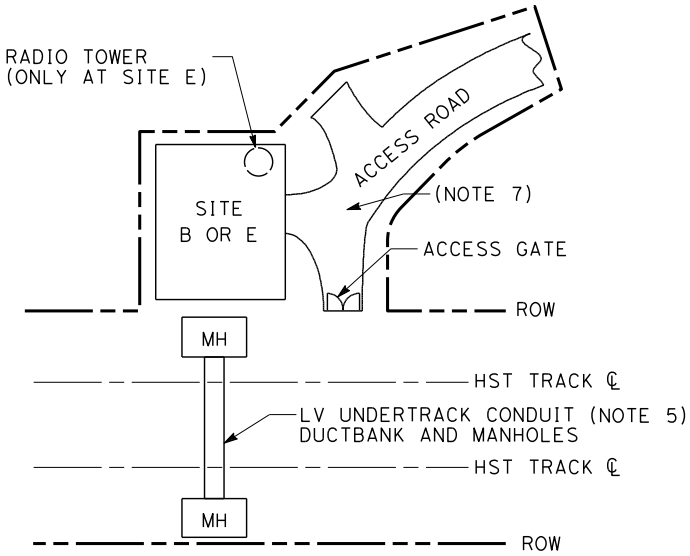
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**NOTES:**

1. SITES B AND E MAY BE LOCATED ON EITHER SIDE OF THE TRACK.
2. WHERE POSSIBLE, FOR SITES B AND E, ALTERNATIVES SHALL BE PROVIDED ON THE OPPOSITE SIDE OF THE TRACK.
3. SITE E WILL ACCOMMODATE TRAIN CONTROL SYSTEM EQUIPMENT, COMMUNICATIONS SYSTEM EQUIPMENT WITH THE RADIO TOWER, AND WAYSIDE POWER CONTROL (WPC) EQUIPMENT.
4. AN ACCESS ROAD AND AN ACCESS GATE SHALL BE PROVIDED FOR EACH SITE PER THE CIVIL DESIGN CRITERIA.
5. AN ASSEMBLY, CONSISTING OF A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES, SHALL BE PROVIDED AT EACH TRAIN CONTROL SITE. REFER TO COMMUNICATIONS DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE DETAIL REQUIREMENTS.
6. FOR NUMBER OF CONDUITS REFER TO COMMUNICATIONS DESIGN CRITERIA AND DRAWING "TYPICAL CROSS SECTION SYSTEMS LOW-VOLTAGE CONDUIT DUCTBANK".
7. ACCESS ROADS AND ACCESS GATES ARE SHOWN FOR INFORMATION ONLY. REFER TO CIVIL DESIGN CRITERIA FOR ACCESS ROADS AND ACCESS GATES DETAIL REQUIREMENTS.



**SITE B OR E**

WITH LOW-VOLTAGE UNDERTRACK CONDUIT DUCTBANK, ACCESS ROADS AND GATES

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUF TIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

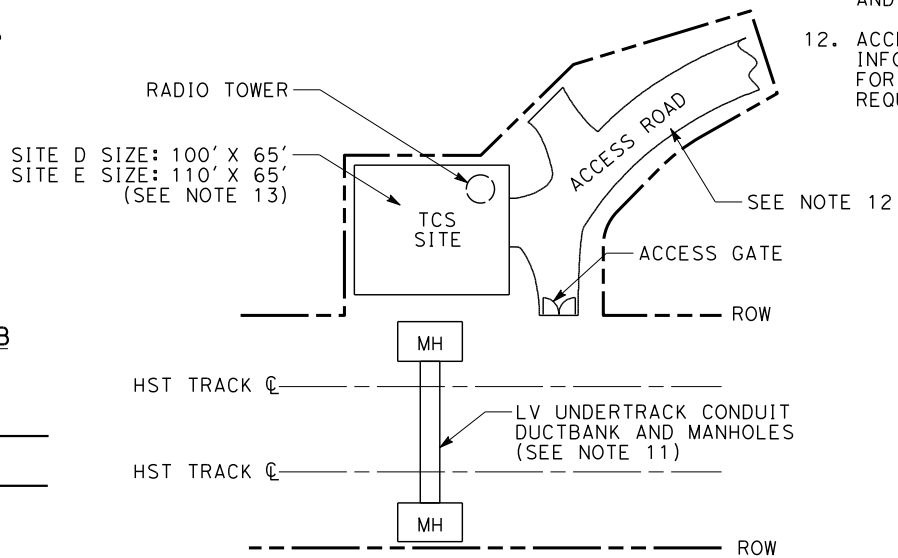
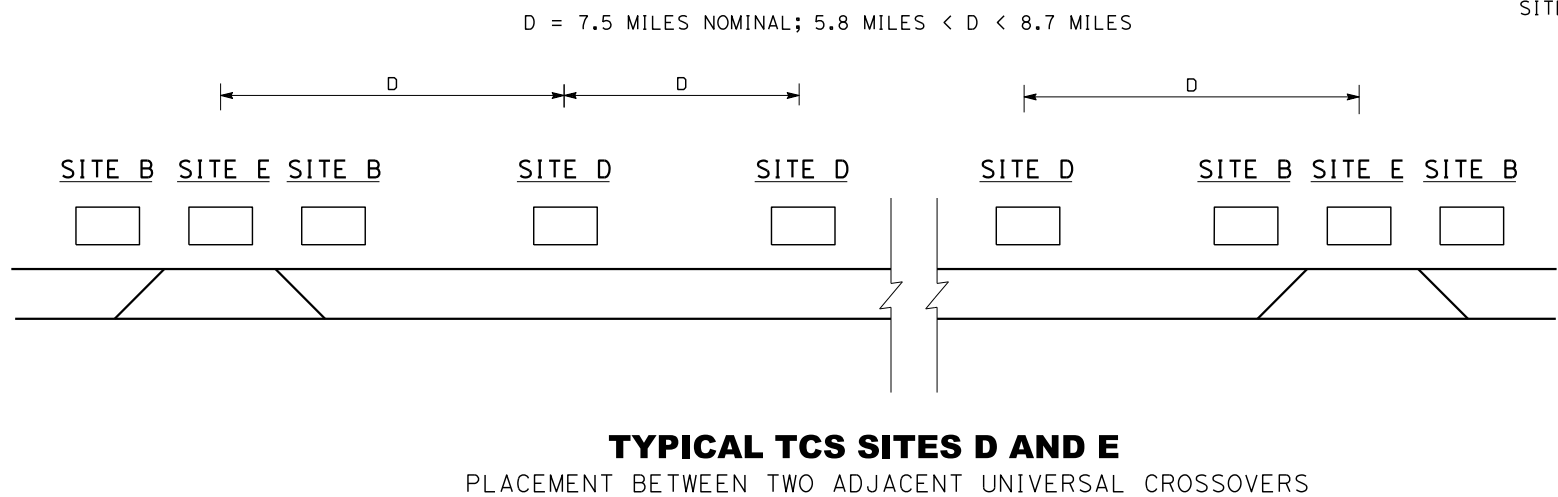
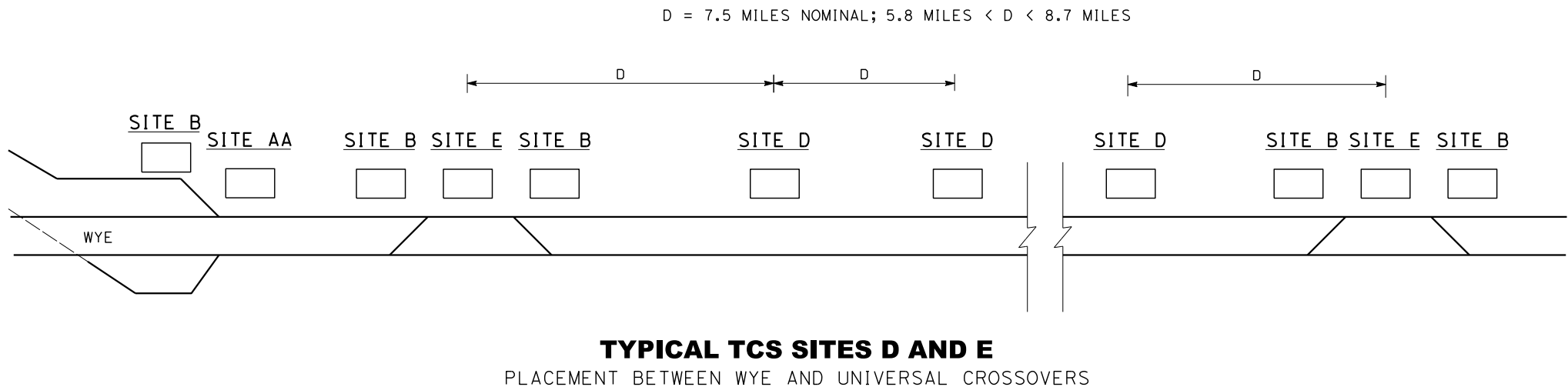
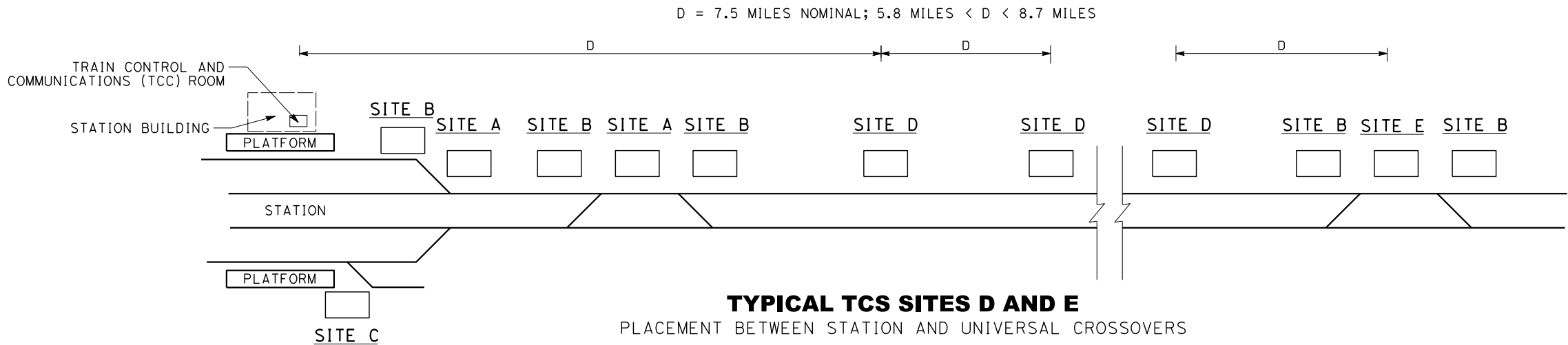


<b>CALIFORNIA HIGH-SPEED TRAIN PROJECT TRAIN CONTROL DIRECTIVE</b>
TYPICAL TCS SITES AND INTERLOCKINGS LAYOUT AT UNIVERSAL CROSSTOPS

CONTRACT NO.
DRAWING NO. DD-TC-201
SCALE NO SCALE
SHEET NO.



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**TYPICAL SITES D & E CONFIGURATION**  
WITH LOW-VOLTAGE UNDERTRACK CONDUIT DUCTBANK, ACCESS ROADS AND GATES

- NOTES:**
- THIS DRAWING SHOWS A TYPICAL SPACING BETWEEN STATION TRAIN CONTROL AND COMMUNICATIONS (TCC) ROOM, D SITES, AND E SITES AT UNIVERSAL CROSSOVERS.
  - IF THE STATION DESIGN IS NOT AVAILABLE, THE CENTER LINE OF PLATFORM SHALL BE USED AS A REFERENCE POINT INSTEAD OF THE EXACT LOCATION OF THE TCC ROOM.
  - D SITES SHALL BE PROVIDED AT THE NOMINAL DISTANCE OF 7.5 MILES BETWEEN STATION TCC ROOM AND ADJACENT SITE D, BETWEEN 2 ADJACENT D SITES, AND BETWEEN ADJACENT D SITE AND E SITE AT UNIVERSAL CROSSOVERS.
  - MINIMUM SPACING BETWEEN STATION TCC ROOM AND ADJACENT SITE D, BETWEEN 2 ADJACENT D SITES, AND BETWEEN ADJACENT D SITE AND E SITE AT UNIVERSAL CROSSOVERS IS 5.8 MILES.
  - MAXIMUM SPACING BETWEEN STATION TCC ROOM AND ADJACENT SITE D, BETWEEN 2 ADJACENT D SITES, AND BETWEEN ADJACENT D SITE AND E SITE AT UNIVERSAL CROSSOVERS IS 8.7 MILES.
  - D SITES MAY BE LOCATED ON EITHER SIDE OF TRACK.
  - FOR EACH D SITE, AN ALTERNATIVE SHALL BE PROVIDED.
  - IF THERE IS AN EXISTING STAND ALONE RADIO SITE (SRS) WITHIN THE SPACING LIMITS FOR A D SITE, THE SRS CAN BE REPLACED WITH A NEW D SITE.
  - IF THERE IS A TRACTION POWER FACILITY (TPF) WITHIN THE SPACING LIMITS FOR AN ATC D SITE, THE ATC D SITE CAN BE PLACED CLOSE TO THE TPF SITE TO UTILIZE THE SAME ACCESS ROAD.
  - THIS CRITERIA IS NOT APPLICABLE FOR TUNNELS LONGER THAN 6 MILES AND THOSE WILL BE CONSIDERED AS A SPECIAL CASE.
  - AN ASSEMBLY, CONSISTING OF A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES, SHALL BE PROVIDED AT EACH TRAIN CONTROL SITE. REFER TO COMMUNICATIONS DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE DETAIL REQUIREMENTS.
  - ACCESS ROADS AND ACCESS GATES ARE SHOWN FOR INFORMATION ONLY. REFER TO CIVIL DESIGN CRITERIA FOR ACCESS ROADS AND ACCESS GATES DETAIL REQUIREMENTS.

REV	DATE	BY	CHK	APP	DESCRIPTION

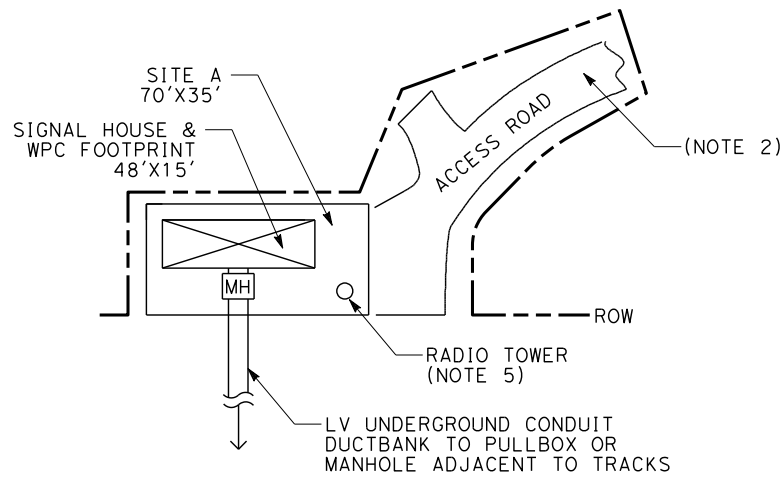
DESIGNED BY I. MUFTIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014



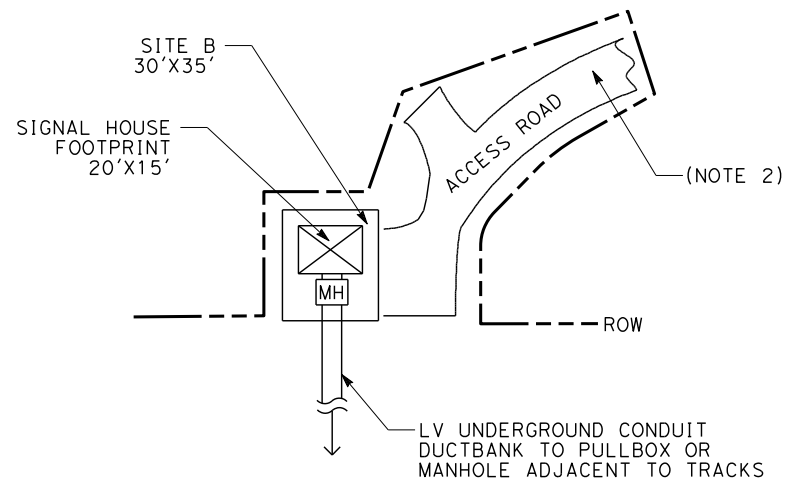
<b>CALIFORNIA HIGH-SPEED TRAIN PROJECT TRAIN CONTROL DIRECTIVE</b>
TYPICAL TCS SITES D AND E CONFIGURATION

CONTRACT NO.
DRAWING NO. DD-TC-202
SCALE NO SCALE
SHEET NO.

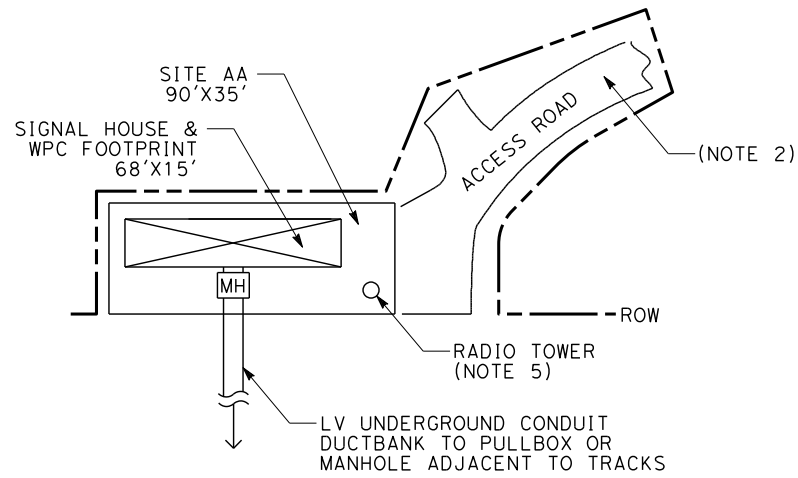
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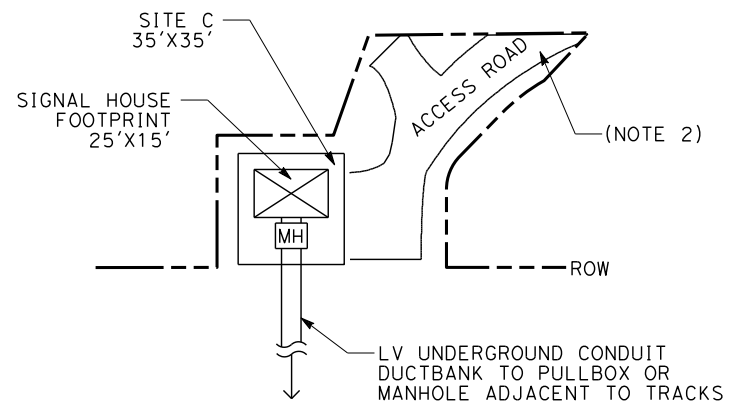
SITE A TYPICAL CONFIGURATION



SITE B TYPICAL CONFIGURATION



SITE AA TYPICAL CONFIGURATION



SITE C TYPICAL CONFIGURATION

NOTES:

1. SITES A AND AA WILL ACCOMMODATE TRAIN CONTROL, COMMUNICATIONS SYSTEM (WITH RADIO TOWER), AND WAYSIDE POWER CONTROL (WPC) EQUIPMENT. A SEPARATE ROOM OF 25 SQUARE FEET SHALL BE RESERVED FOR WPC WITHIN THE SIGNAL HOUSE.
2. REFER TO COMMUNICATIONS DRAWINGS FOR DUCTBANK, MANHOLE CROSS SECTIONS, DETAILS AND ELEVATIONS.
3. FOR NUMBERS OF CONDUITS REFER TO COMMUNICATION DESIGN CRITERIA AND DRAWING "TYPICAL CROSS SECTION SYSTEMS LOW-VOLTAGE CONDUIT DUCTBANK".
4. FOR RADIO TOWER REQUIREMENTS AND CLEARANCES REFER TO COMMUNICATIONS DESIGN CRITERIA AND DRAWINGS.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUFTIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

PARSONS  
BRINCKERHOFF



CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE

TYPICAL TCS SITES  
A, AA, B, & C LAYOUT

CONTRACT NO.
DRAWING NO. DD-TC-203
SCALE NO SCALE
SHEET NO.



1. FOR RADIO TOWER REQUIREMENTS AND CLEARANCES REFER TO COMMUNICATIONS DESIGN CRITERIA AND DRAWINGS.
2. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES, CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES, FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.

REV	DATE	BY	CHK	APP
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DATE  
8/29/2014

**PARSONS  
BRINCKERHOFF**



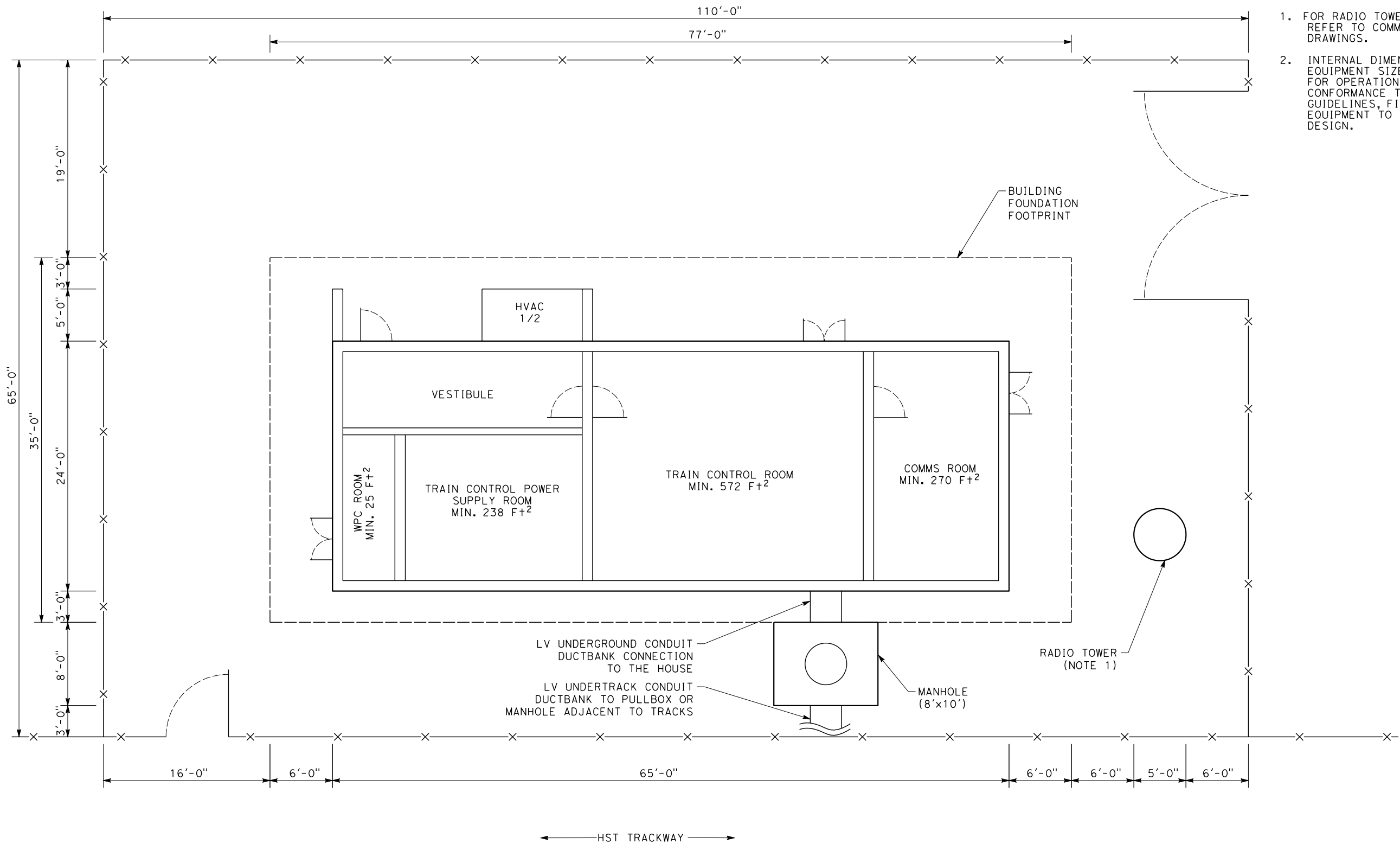
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

# CALIFORNIA HIGH-SPEED TRAIN PROJECT TRAIN CONTROL DIRECTIVE

TYPICAL TCS SITE D LAYOUT

\_\_\_\_\_

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- NOTES:**
1. FOR RADIO TOWER REQUIREMENTS AND CLEARANCES REFER TO COMMUNICATIONS DESIGN CRITERIA AND DRAWINGS.
  2. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES, CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES, FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY I. MUF TIC
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



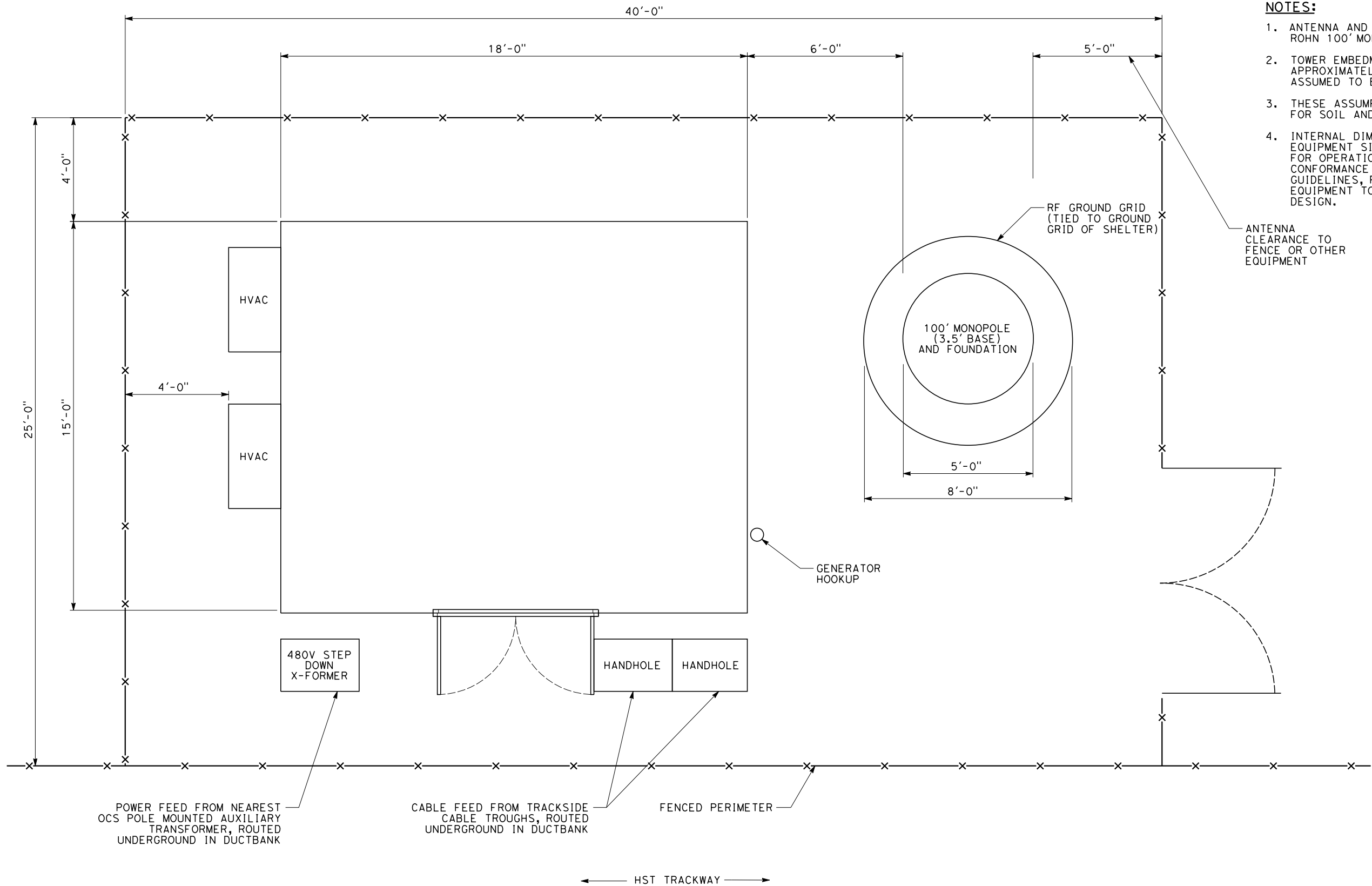
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
TRAIN CONTROL DIRECTIVE**

TYPICAL TCS SITE E LAYOUT

CONTRACT NO.
DRAWING NO. DD-TC-205
SCALE NO SCALE
SHEET NO.

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- NOTES:**
1. ANTENNA AND SUPPORT DIMENSIONS ARE BASED ON ROHN 100' MONOPOLE T100HA.
  2. TOWER EMBEDMENT DEPTH ASSUMED TO BE APPROXIMATELY 25 FEET TOWER BASE AND FOUNDATION ASSUMED TO BE 5 FOOT DIAMETER.
  3. THESE ASSUMPTIONS SHALL BE VALIDATED BY DESIGN FOR SOIL AND ENVIRONMENTAL CONDITIONS.
  4. INTERNAL DIMENSIONS ARE SHOWN FOR TYPICAL EQUIPMENT SIZES. CLEARANCES AND ACCESSIBILITY FOR OPERATION AND MAINTENANCE OF EQUIPMENT AND CONFORMANCE TO RELEVANT CODES, STANDARDS, AND GUIDELINES, FINAL DIMENSIONS AND CONFIGURATION OF EQUIPMENT TO BE DETERMINED DURING FINAL SYSTEMS DESIGN.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. DALOIA
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

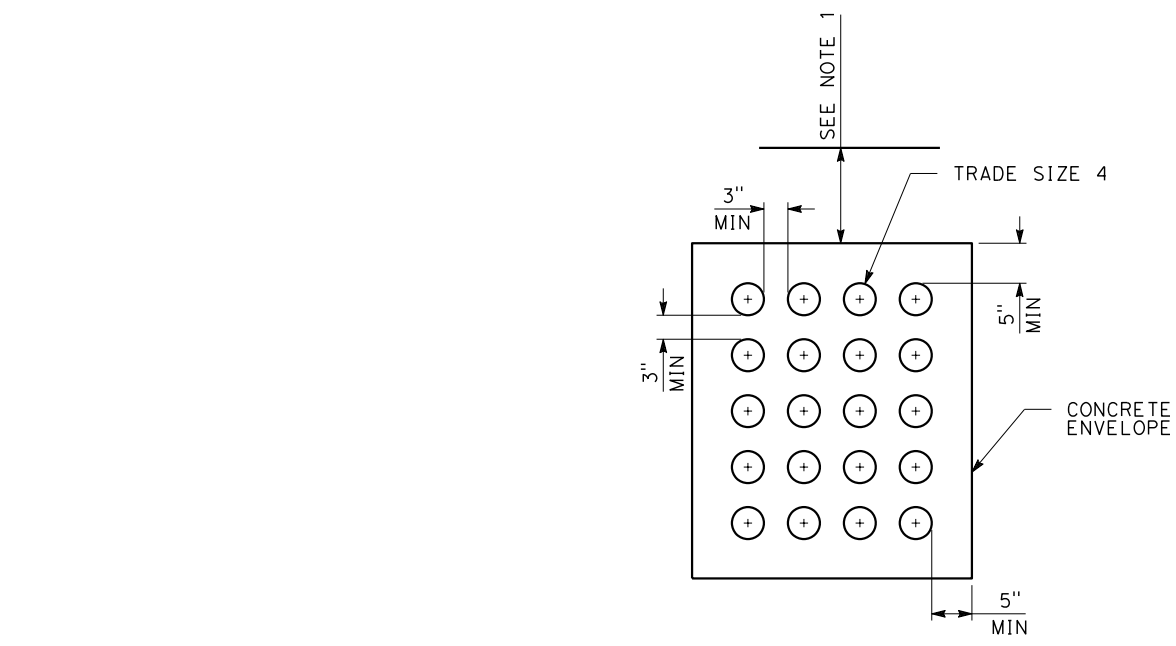
**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE**

CONCEPTUAL LAYOUT  
COMMUNICATIONS SPACES  
PHYSICAL SITE LAYOUT

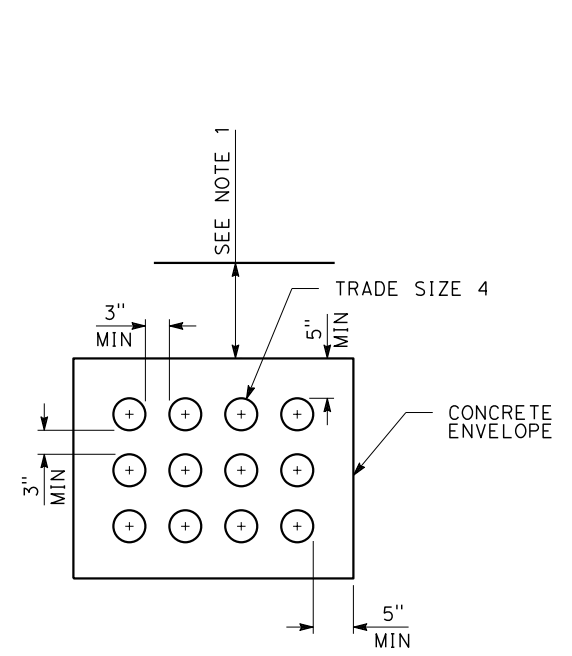
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DRAWING NO. DD-CO-F080
SCALE NO SCALE
SHEET NO.

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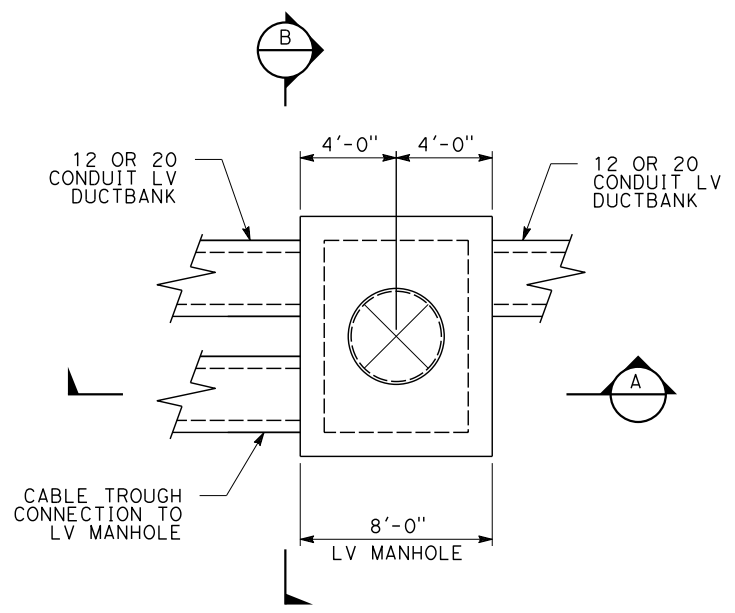
mincio



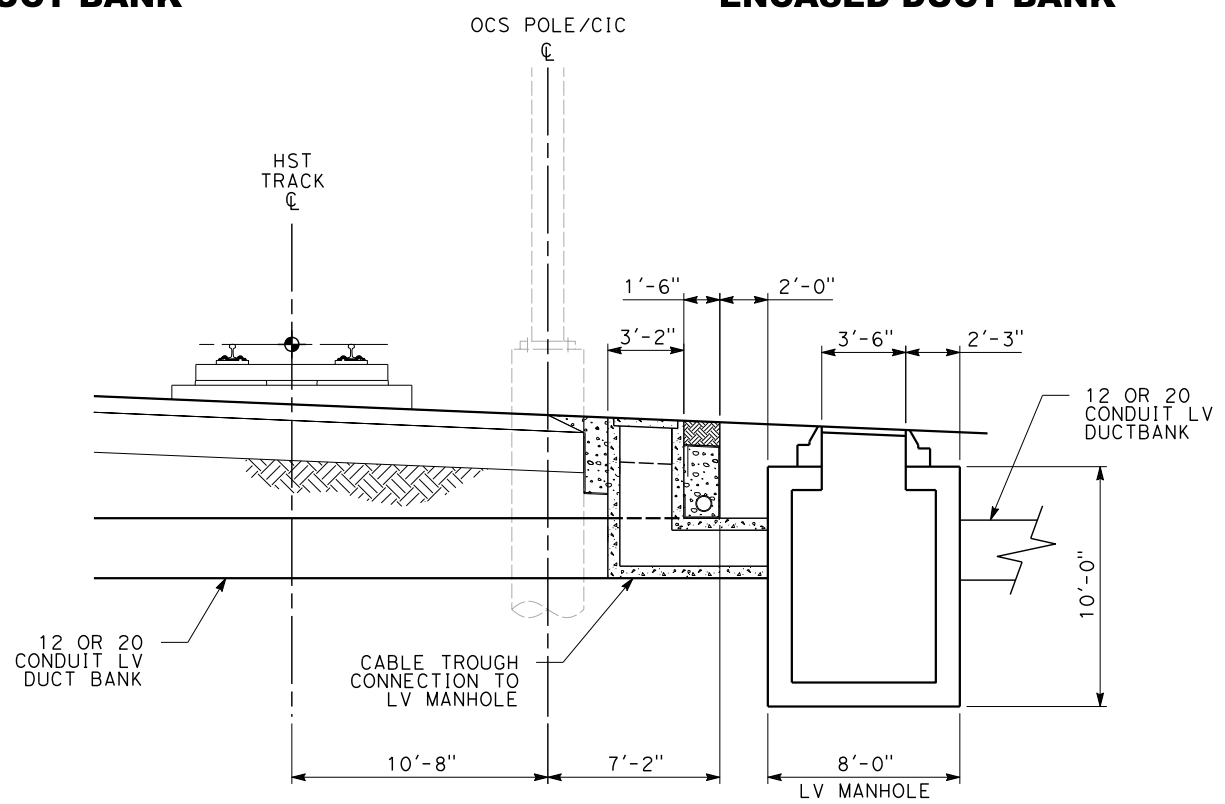
20 CONDUIT CONCRETE  
ENCASED DUCT BANK



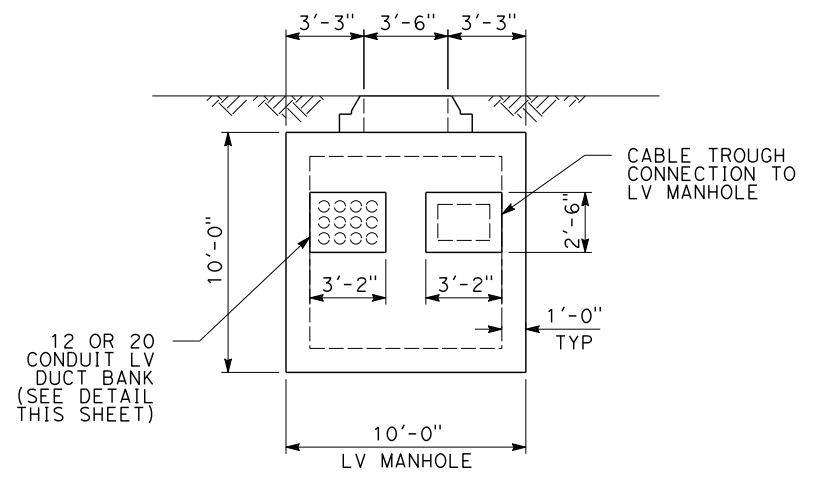
12 CONDUIT CONCRETE  
ENCASED DUCT BANK



PLAN



SECTION A



SECTION B

NOTES:

1. CONCRETE ENCASED DUCT BANK TO BE PLACED A MINIMUM 6' BELOW TOP OF RAIL AND MINIMUM 3' BELOW GRADE WHEN NO RAIL IS PRESENT.
2. LOW VOLTAGE DUCT BANK TO BE LOCATED PER THE CRITERIA LISTED IN THE COMMUNICATIONS DESIGN CRITERIA CHAPTER.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. DALOIA
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

PARSONS  
BRINCKERHOFF



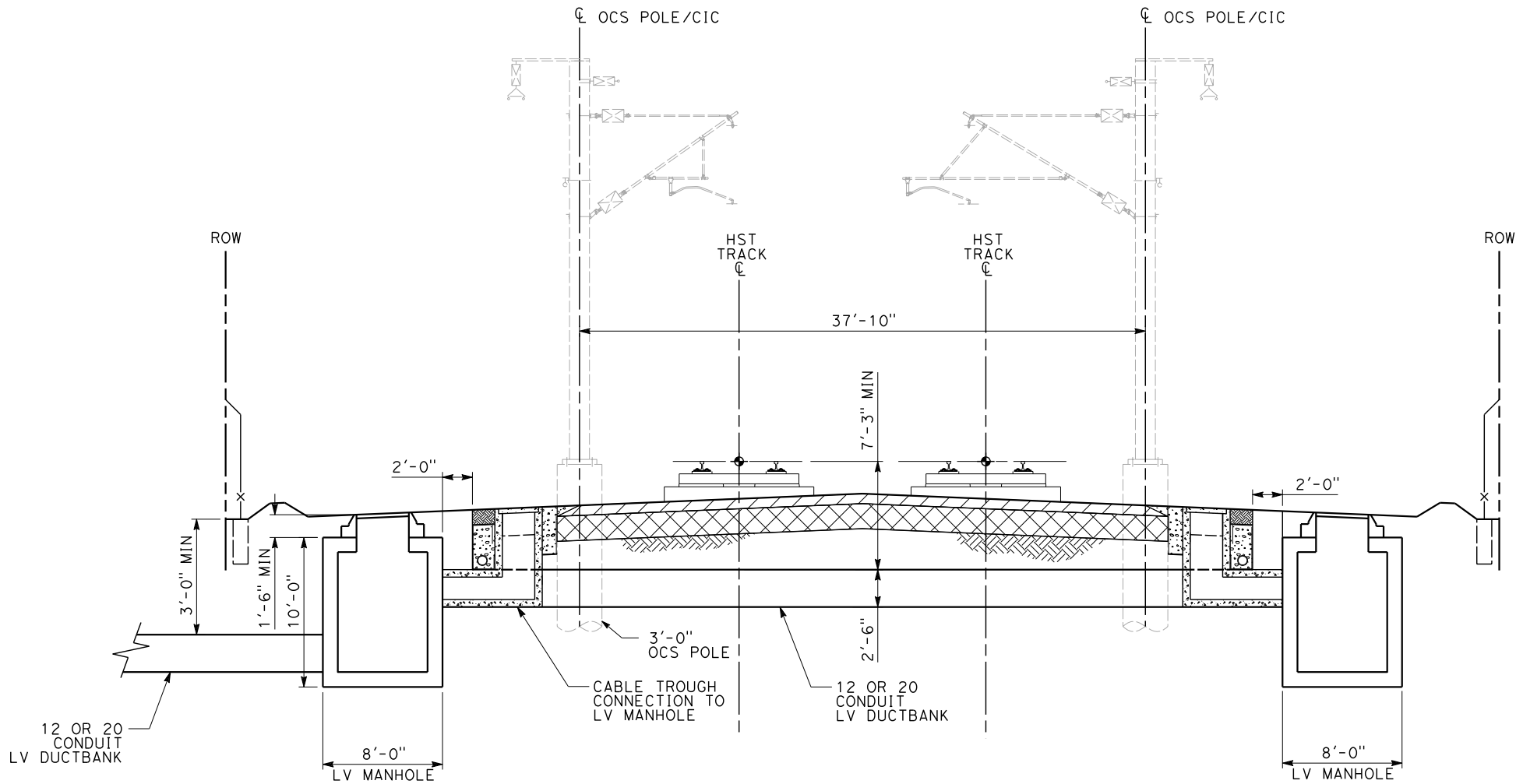
CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE

TYPICAL CROSS SECTION  
LOW VOLTAGE MANHOLE / CABLE TROUGH / DUCTBANK  
DETAILS

CONTRACT NO.
DRAWING NO. DD-CO-G023
SCALE NO SCALE
SHEET NO.

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- NOTES:
1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.
  2. MANHOLE SHALL NOT BE ALIGNED WITH OCS FOUNDATION OR FENCE FOOTING.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY B. BANKS
DRAWN BY V. HUANTE
CHECKED BY C. DALOIA
IN CHARGE R. SCHMEDES
DATE

PARSONS  
BRINCKERHOFF

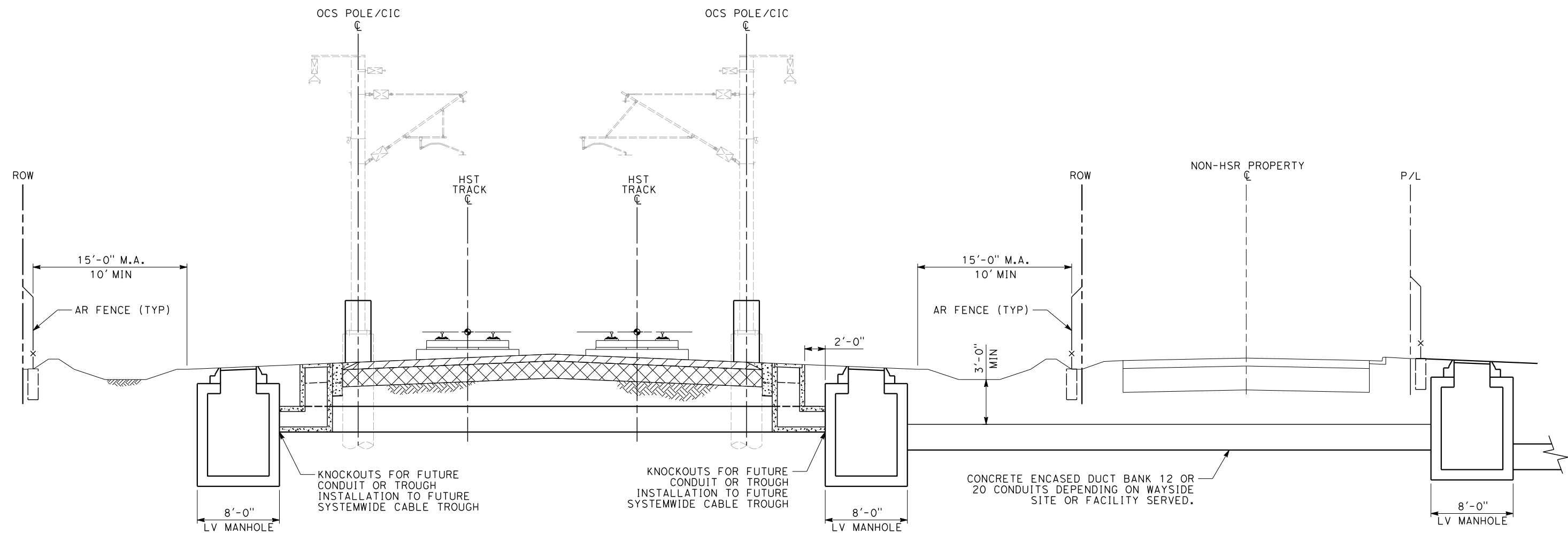


CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE  
TYPICAL CROSS SECTION  
SYSTEMS LOW-VOLTAGE  
UNDERTRACK CONDUIT DUCT BANK  
AT-GRADE

CONTRACT NO.
DRAWING NO. DD-CO-G040
SCALE NO SCALE
SHEET NO.

1. TRACK, SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN.



REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY	B. BANKS
DRAWN BY	V. HUANTE
CHECKED BY	C. DALOIA
IN CHARGE	R. SCHMEDES
DATE	01/24/2014

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BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

## CALIFORNIA HIGH-SPEED TRAIN PROJECT COMMUNICATIONS DIRECTIVE

TYPICAL CROSS SECTION  
SYSTEMS LOW-VOLTAGE  
UNDER TRACK/UNDERGROUND CONDUIT DUCT BANK  
AT-GRADE

CONTRACT NO.
DRAWING NO. DD-CO-G041
SCALE NO SCALE
SHEET NO.

RFP No. HSR 14-32 – INITIAL RELEASE - 05/27/2015

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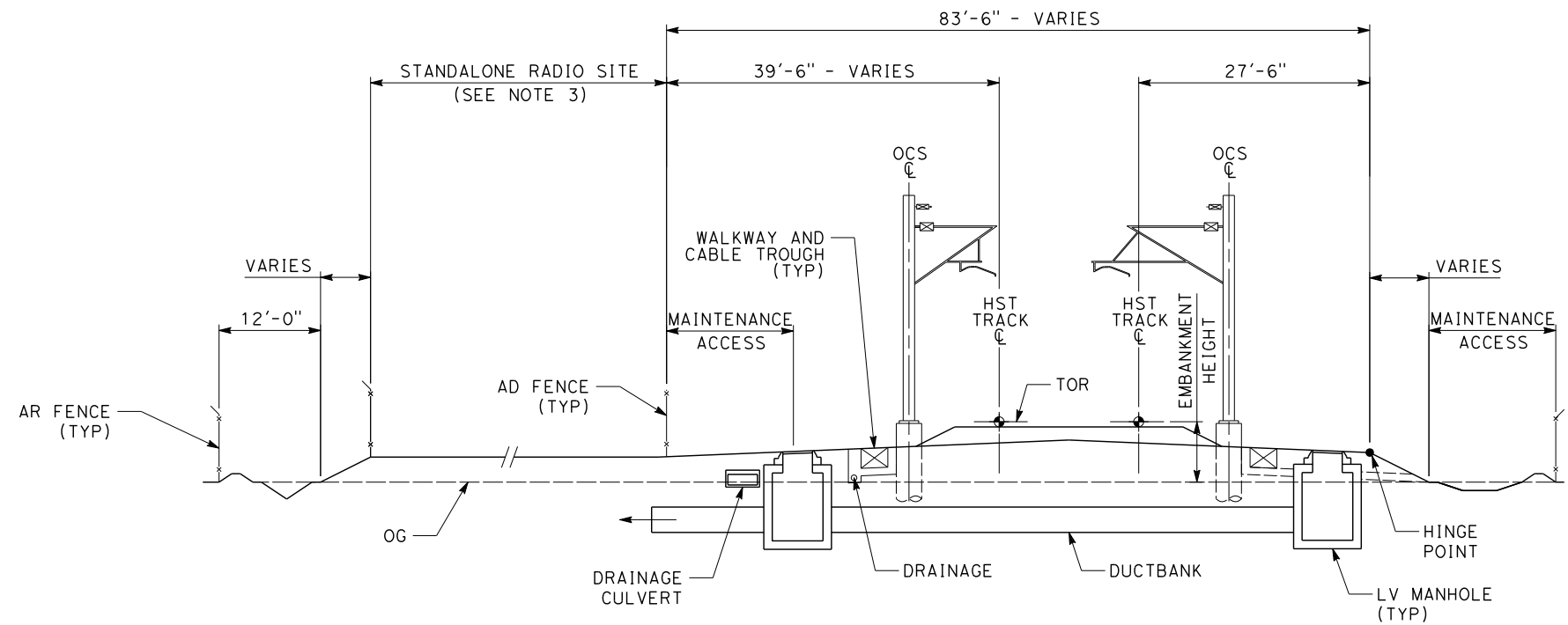
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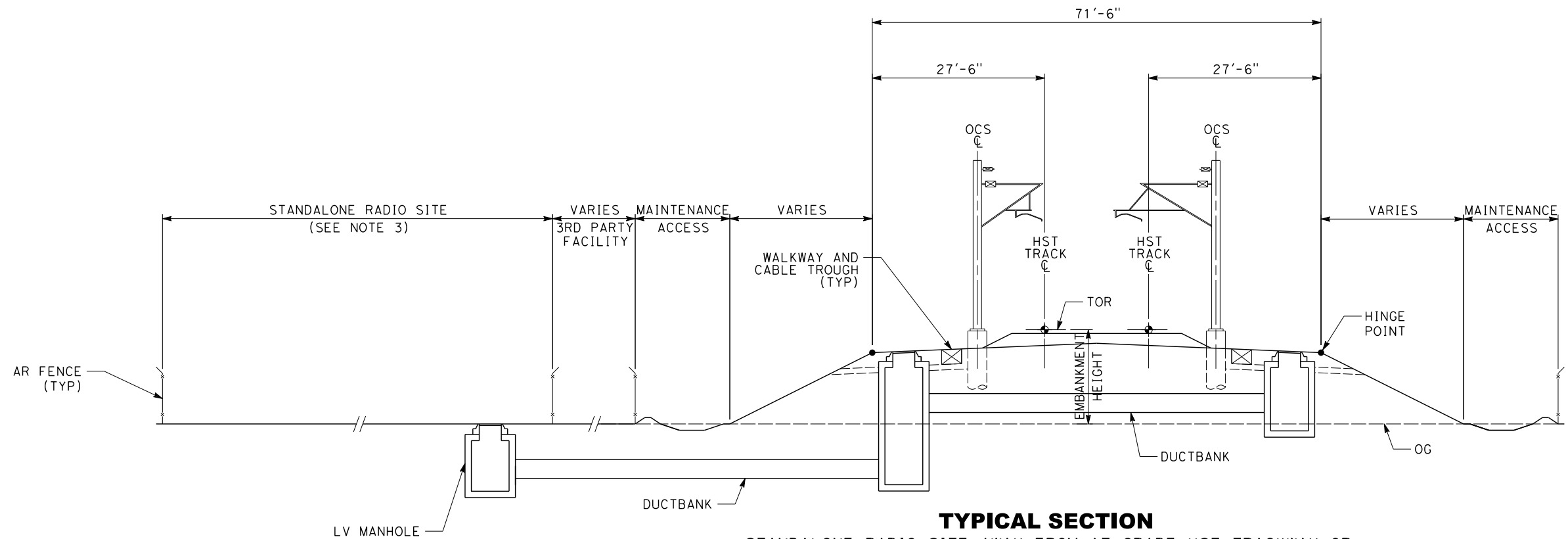
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**TYPICAL SECTION**  
STANDALONE RADIO SITE ADJACENT TO AT-GRADE HST TRACKWAY  
WITH EMBANKMENT HEIGHT (TOR-OG)  $\leq$  10 FEET



**TYPICAL SECTION**  
STANDALONE RADIO SITE AWAY FROM AT-GRADE HST TRACKWAY OR  
EMBANKMENT HEIGHT (TOR-OG)  $>$  10 FEET

**NOTES:**

1. TYPICAL CROSS-SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR A MINIMUM LENGTH EQUAL TO THE LONGITUDINAL DIMENSION OF THE SYSTEMS SITE.
2. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
3. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
4. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.
5. FOR STANDALONE RADIO SITE REQUIREMENTS REFER TO COMMUNICATIONS SYSTEMS SITE REQUIREMENTS.
6. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES TO BE PROVIDED AT SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
7. SYSTEM SITES AWAY FROM TRACKWAY, SEPARATED BY A THIRD-PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
8. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLE TO BE PROVIDED UNDERNEATH 3RD PARTY RIGHT-OF-WAY TO CONNECT TO LOW VOLTAGE UNDERTRACK MANHOLES AND DUCTBANK.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. DALOIA
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



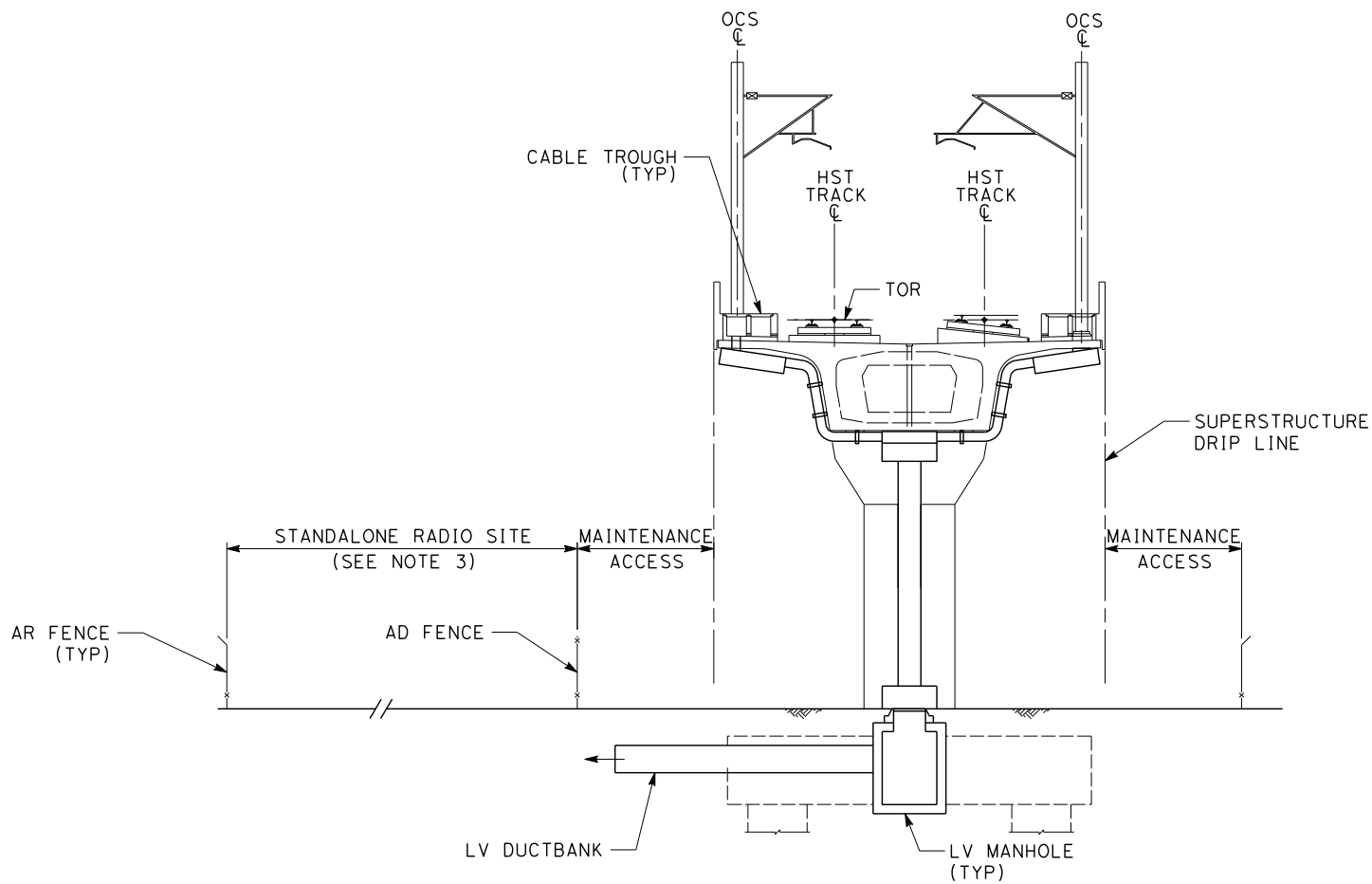
**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE**

SYSTEMS SITE  
STANDALONE RADIO SITE  
AT-GRADE

CONTRACT NO.
DRAWING NO. DD-CO-G050
SCALE NO SCALE
SHEET NO.

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**TYPICAL SECTION**  
STANDALONE RADIO SITE AT AERIAL TRACKWAY

**NOTES:**

1. SYSTEM SITES AT AERIAL TRACKWAY ARE UNDESIED. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. TYPICAL CROSS-SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR A MINIMUM LENGTH EQUAL TO THE LONGITUDINAL DIMENSION OF THE SYSTEMS SITE.
3. FOR STANDALONE RADIO SITE REQUIREMENTS REFER TO COMMUNICATIONS SYSTEMS SITE REQUIREMENTS.
4. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
5. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
6. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY  
C. DALOIA  
DRAWN BY  
V. LAVERDE  
CHECKED BY  
B. MCNALLY  
IN CHARGE  
B. BANKS  
DATE  
8/29/2014

**PARSONS  
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COMMUNICATIONS DIRECTIVE**

SYSTEMS SITE  
STANDALONE RADIO SITE  
AERIAL

CONTRACT NO.  
DRAWING NO.  
DD-CO-G051  
SCALE  
NO SCALE  
SHEET NO.

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REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. DALOIA
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

PARSONS  
BRINCKERHOFF

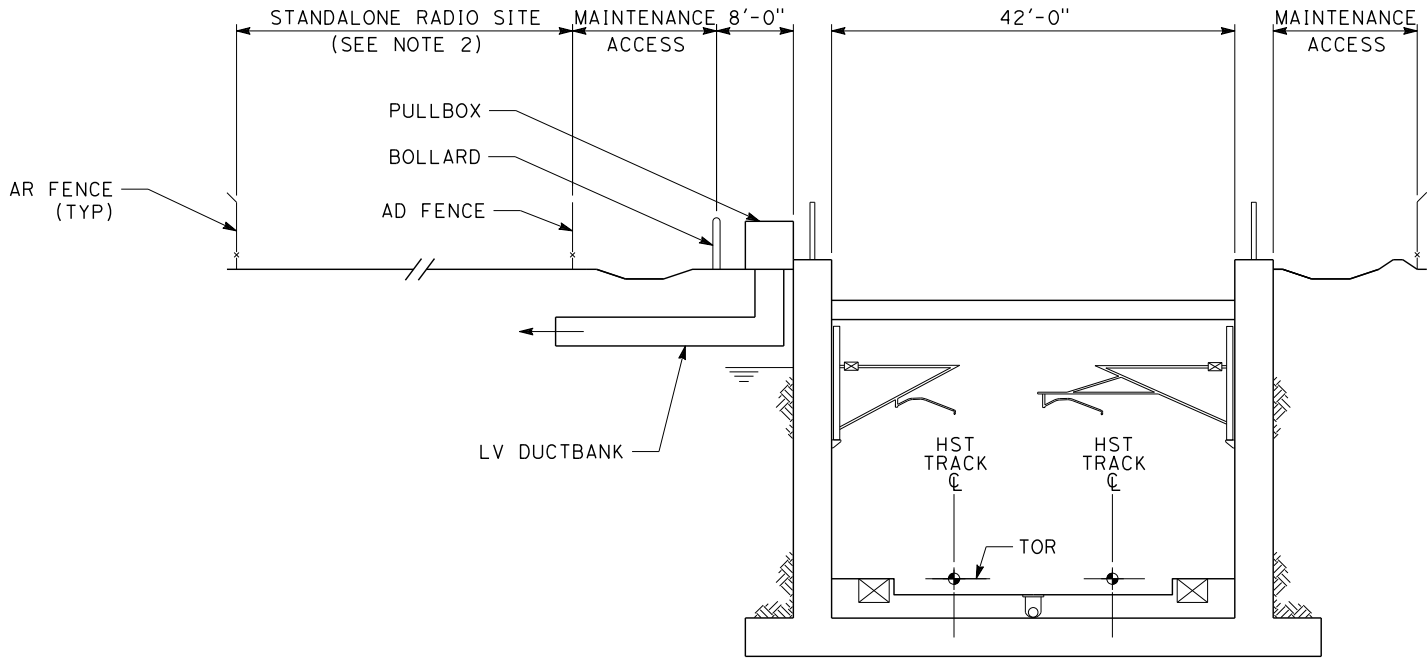


CALIFORNIA  
HIGH-SPEED RAIL AUTHORITY

CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE

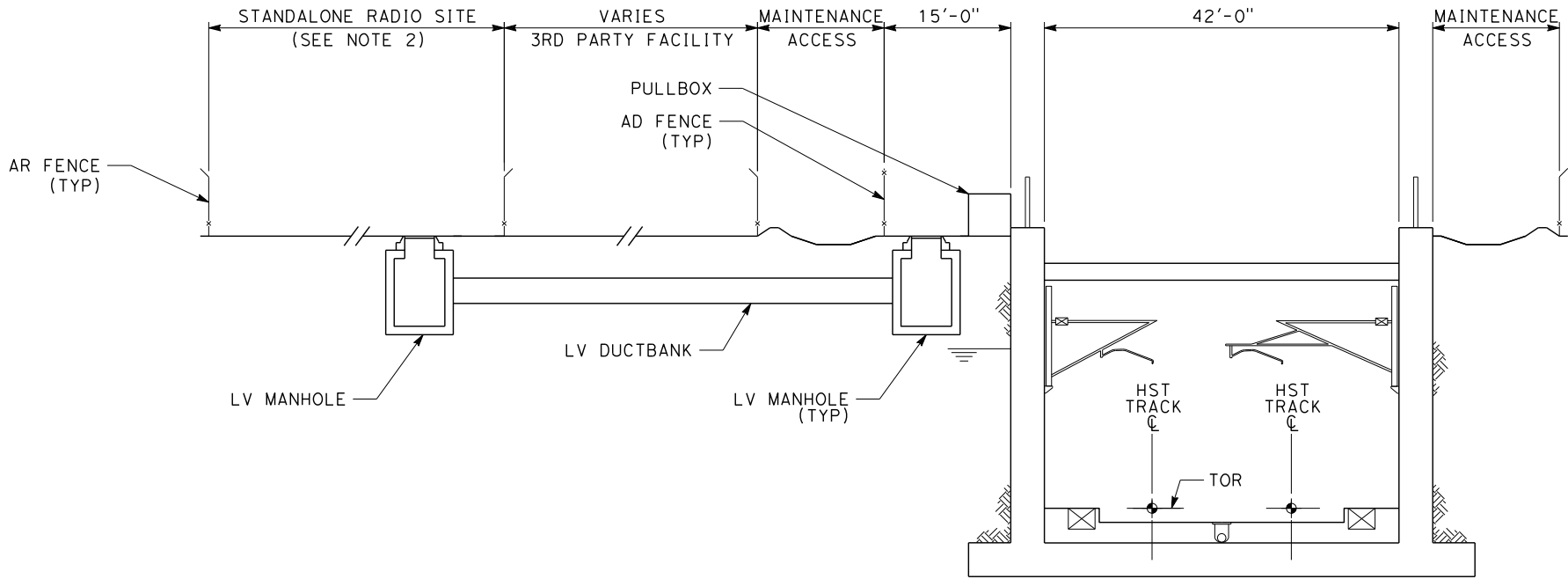
SYSTEMS SITE  
STANDALONE RADIO SITE  
TRENCH

CONTRACT NO.
DRAWING NO. DD-CO-G052
SCALE NO SCALE
SHEET NO.



TYPICAL SECTION

STANDALONE RADIO SITE ADJACENT TO TRENCH HST TRACKWAY



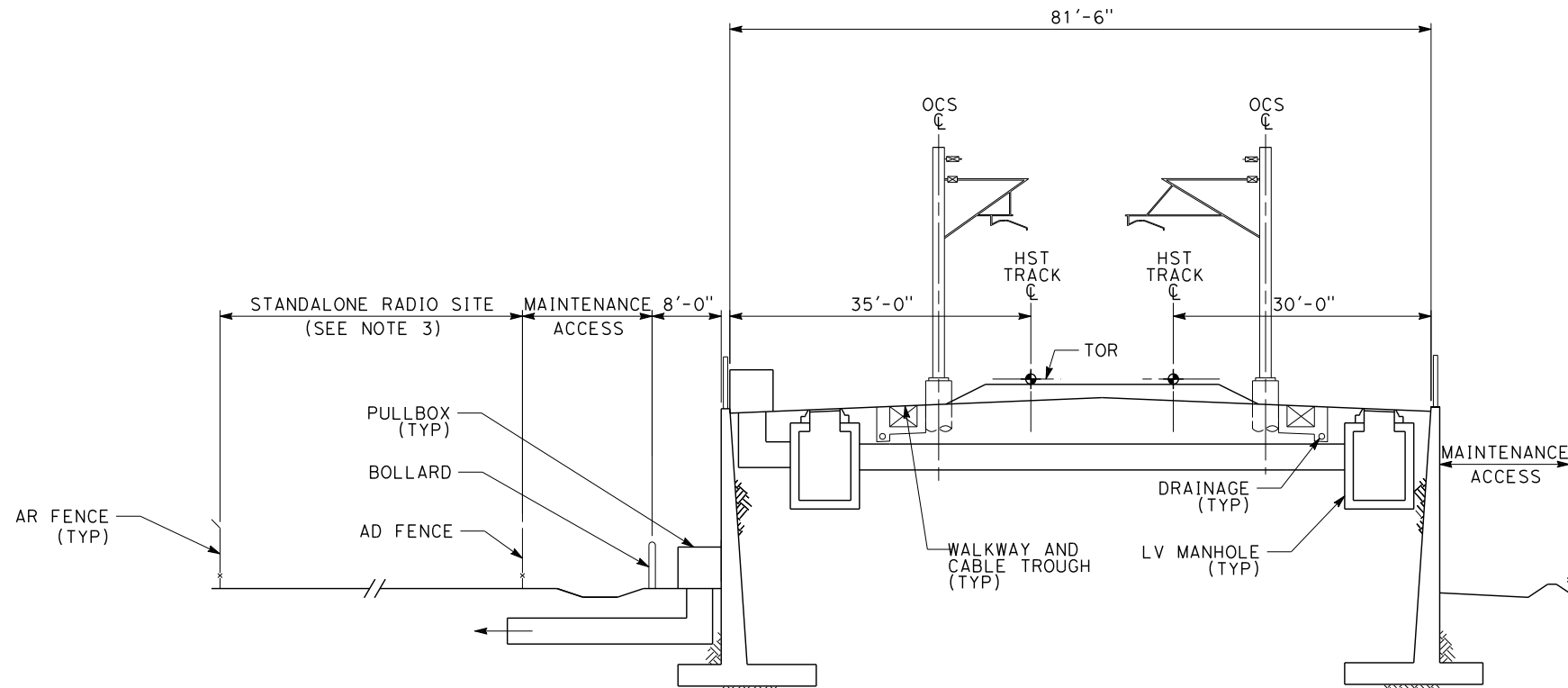
TYPICAL SECTION

STANDALONE RADIO SITE AWAY FROM TRENCH HST TRACKWAY

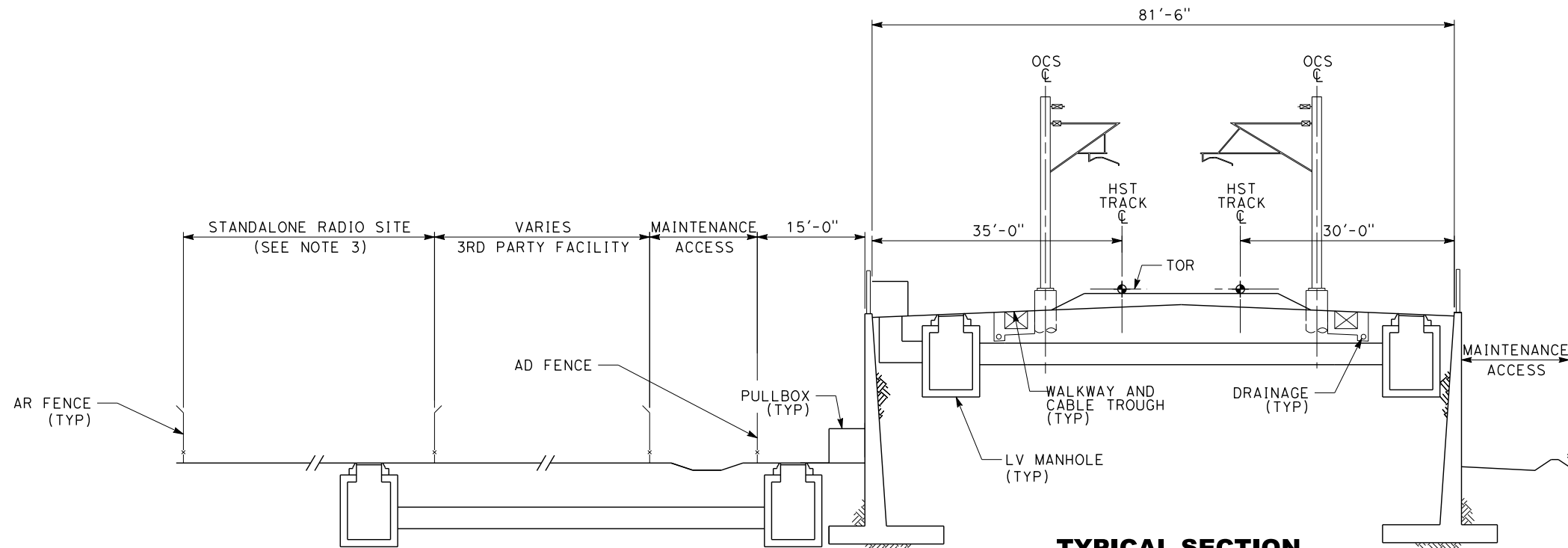
NOTES:

1. SYSTEM SITES AT TRENCH TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS SITES.
3. TYPICAL CROSS-SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR A MINIMUM LENGTH EQUAL TO THE LONGITUDINAL DIMENSION OF THE SYSTEMS SITE.
4. FOR STANDALONE RADIO SITE REQUIREMENTS REFER TO COMMUNICATIONS SYSTEMS SITE REQUIREMENTS.
5. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
6. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
7. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.
8. SYSTEM SITES AWAY FROM TRACKWAY, SEPARATED BY A THIRD-PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
9. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLES TO BE PROVIDED UNDERNEATH 3RD PARTY RIGHT-OF-WAY.

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**TYPICAL SECTION**  
STANDALONE RADIO SITE ADJACENT TO HST TRACKWAY  
RETAINING WALL



**TYPICAL SECTION**  
STANDALONE RADIO SITE AWAY FROM HST TRACKWAY  
RETAINING WALL

**NOTES:**

1. SYSTEM SITES AT RETAINED FILL TRACKWAY ARE UNDESIRABLE. THESE CROSS-SECTIONS ARE ONLY APPLICABLE IF AT-GRADE SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
2. FOR RETAINED-FILLED TRACKWAYS, REINFORCED CONCRETE RETAINING WALLS SHALL BE USED AT SYSTEMS SITES.
3. TYPICAL CROSS-SECTIONAL WIDTH SHOWN SHALL BE PROVIDED FOR A MINIMUM LENGTH EQUAL TO THE LONGITUDINAL DIMENSION OF THE SYSTEMS SITE.
4. FOR STANDALONE RADIO SITE REQUIREMENTS REFER TO COMMUNICATIONS SYSTEMS SITE REQUIREMENTS.
5. FOR ACCESS RESTRICTION FENCING AND BERM DETAILS, REFER TO CIVIL DIRECTIVE DRAWINGS.
6. TRACK SYSTEMS AND DRAINAGE ARE SCHEMATIC AND DO NOT REPRESENT DESIGN. FOR SITE DRAINAGE REQUIREMENTS REFER TO DRAINAGE DIRECTIVE DRAWINGS.
7. FOR ACCESS ROADS, ACCESS GATE AND ACCESS TO TRACKWAY REQUIREMENTS REFER TO SAFETY AND SECURITY DESIGN REQUIREMENTS FOR INFRASTRUCTURE ELEMENTS AND CIVIL DESIGN CRITERIA.
8. A LOW VOLTAGE UNDERTRACK DUCTBANK WITH 2 LOW VOLTAGE MANHOLES TO BE PROVIDED AT SYSTEMS SITE. REFER TO COMMUNICATIONS DESIGN CRITERIA MANUAL AND DIRECTIVE DRAWINGS FOR LOW VOLTAGE UNDERTRACK CONDUIT DUCTBANK AND MANHOLE REQUIREMENTS.
9. SYSTEM SITES AWAY FROM TRACKWAY, SEPARATED BY A THIRD-PARTY RIGHT-OF-WAY ARE UNDESIRABLE. AWAY CROSS-SECTION IS ONLY APPLICABLE IF ADJACENT SOLUTION IS DEMONSTRATED TO VIOLATE SITE SPACING REQUIREMENTS OR OTHER CRITICAL CRITERIA.
10. LOW VOLTAGE UNDERGROUND DUCTBANK AND MANHOLE TO BE PROVIDED UNDERNEATH 3RD PARTY RIGHT-OF-WAY TO CONNECT TO LOW VOLTAGE UNDERTRACK MANHOLES AND DUCTBANK.

REV	DATE	BY	CHK	APP	DESCRIPTION

DESIGNED BY C. DALOIA
DRAWN BY V. LAVERDE
CHECKED BY B. MCNALLY
IN CHARGE B. BANKS
DATE 8/29/2014

**PARSONS  
BRINCKERHOFF**



**CALIFORNIA**  
HIGH-SPEED RAIL AUTHORITY

**CALIFORNIA HIGH-SPEED TRAIN PROJECT  
COMMUNICATIONS DIRECTIVE**

SYSTEMS SITE  
STANDALONE RADIO SITE  
RETAINED-FILL

CONTRACT NO.
DRAWING NO. DD-CO-G053
SCALE NO SCALE
SHEET NO.